1957

Eugenics Quarterly

Vol. 4 March, 1957 No. 1

DIFFERENTIAL FERTILITY BY DURATION OF MARRIAGE
Christopher Tietze and Wilson H. Grabill

TRAITS, FACTORS, AND GENES
William R. Thompson

FAMILY PLANNING AMONG JAPANESE ON PUBLIC RELIEF
Yoshio Koya, M.D.

American Eugenics Society, Inc.

Eugenics Quarterly

Published by the AMERICAN EUGENICS SOCIETY, Inc.
230 Park Avenue, New York 17, N. Y.

Vol. 4, No. 1 March, 1957

Contents

Differential Fertility by Duration of Marriage, CHRISTOPHER TIETZE AND WILSON H. GRABILL 3–7

Traits, Factors, and Genes, WILLIAM R. THOMPSON 8–16

Family Planning Among Japanese on Public Relief, YOSHIO KOYA, M.D. 17–23

Uniqueness of Man, G. W. BEADLE 24–29

Some Relations Between Thyroid Disease and Genetics, SIDNEY C. WERNER 30–35

Consanguineous Marriages In Italy: A Note, MARCO FRACCARO 36–39

Book Reviews

"Overpopulation and Family Planning" (Proceedings of the Fifth International Conference on Planned Parenthood), DOROTHY H. BRUSH 40–43

"The Hazards to Man of Nuclear and Allied Radiation" (Medical Research Council), GORDON ALLEN, M.D. 43–44

"Mental Disorders in Later Life" (Kaplan), LISSY F. JARVIK, M.D. 44–45

"Zwillingstuberkulose III" (Mitschrich), KAREL PLANANSKY, M.D. 45–46

"Land of the Moon-Children" (Keeler), RICHARD H. POST 46–47

"Warbasse History" (Warbasse), STEPHEN S. VISHER 47–48

Periodical Abstracts

Genetics, GORDON ALLEN, M.D. 49–50

Population, GEORGE F. MAIR 50–54

Annual Meeting, American Eugenics Society 55

Meetings 56

Printed Materials 57–58

Suggestions for Contributors 59

EDITORIAL BOARD

Frederick Osborn, *Chairman*

C. Nash Herndon, M.D. Frank Lorimer

Helen G. Hammons, *Managing Editor*

Consulting Editors: GORDON ALLEN, M.D., JAN BÖÖK, CLYDE V. KISER, GEORGE F. MAIR, JEAN SUTTER

EUGENICS QUARTERLY is published March, June, September, and December at 3110 Elm Ave., Baltimore 11, Md., for the American Eugenics Society, Inc., Room 1523, 230 Park Avenue, New York 17, N. Y. EUGENICS QUARTERLY is mailed to all members of the Society and to non-member subscribers. Subscription price $3.00 per year. Inquiries about membership in the American Eugenics Society should be addressed to the Secretary of the Society, 230 Park Avenue, New York 17, N. Y. Single current copies, 75 cents; single back issue copies, $1.50.

SOCIAL FORCES

A Scientific Medium of Social Study and Interpretation

$5.00 a year

Recent Articles Include:

The Virginia Vote on Segregation

A Typology of Community Leadership

"The Calorie Collectors"—A Study of Spontaneous Group Formation, Collapse, and Reconstruction

Bureaucratic Mass Media: A Study in Role Definitions

The Illiterate in American Society

EDITORS: Gordon W. Blackwell and Katharine Jocher

Published 4 times a year, October, December, March, May
For THE UNIVERSITY OF NORTH CAROLINA PRESS
By THE WILLIAMS & WILKINS COMPANY
Mt. Royal and Guilford Avenues Baltimore 2, Maryland

THE INTERVIEW IN SOCIAL RESEARCH

was the topic of

The American Journal of Sociology

SEPTEMBER, 1956

23 well-known sociologists discuss among other things:

- combinations of age and sex of interviewer and interviewed as they affect responses
- the interviewer as seen by the respondent
- the respondent as seen by the interviewer
- the respondent under stress
- special problems in interviewing

Frenchmen	dowsers
Israelis	medical students
Negro sectarians	homosexuals

Single Copies: $1.75

Order from

THE UNIVERSITY OF CHICAGO PRESS

5750 Ellis Avenue **Chicago 37, Illinois**

Vol. 4, No. 1, March, 1957 *Eugenics Quarterly*

DIFFERENTIAL FERTILITY BY DURATION OF MARRIAGE*

CHRISTOPHER TIETZE
Department of State

WILSON H. GRABILL
Bureau of the Census

IN THE STUDY OF DIFFERENTIAL FERTILITY demographers have relied either on comparatively simple measures of current fertility, such as marital fertility rates (1), or on the retrospective analysis of the accumulated fertility of cohorts. American scholars have generally used birth cohorts (2), while our British colleagues have preferred marriage cohorts (3).

Source of Data

Basic data for the United States are available from a number of official sources. Several years ago the Bureau of the Census published a volume on fertility by duration of marriage, with data for 1910 and 1940 for native white and Negro women by age, residence, education, and occupation of husbands (4). The fertility report of the 1950 Census contained data on fertility by duration of marriage for white and nonwhite women, but only by age and residence (5). At the request of the senior author and with funds supplied by the Population Council, the Census Bureau has recently prepared, for 1950, special tabulations by duration of marriage of a one per cent national sample of women, 15 to 44 years old, married once and husband present, by number of children ever born, cross-classified by major occupation group of husband and (separately) by years of school completed by wife (6).

The present paper utilizes these special tabulations for white women married 10 to 14 years, a group corresponding closely to the marriage cohorts of 1935-39. This particular duration was selected in order to secure data on a group of marriages sufficiently recent to reflect the habits of family building of the war and early postwar periods, and at the same time established long enough to include the greater part of their total fertility (7). The marriage cohorts of 1935-39, however, have experienced some initial reduction of fertility, due to the postponement of first births. Nearly

*Paper read at the annual meeting of the American Sociological Society in September 1956. The opinions expressed are those of the authors and do not necessarily reflect the official views of the agencies with which the authors are connected.

[1]See, among others: Clyde V. Kiser, *Group Differences in Urban Fertility*, Baltimore: Williams & Wilkins, 1942.

[2]Clyde V. Kiser, "Changes in Fertility by Socio-Economic Status during 1940-1950," *Milbank Memorial Fund Quarterly*, 33, October, 1955, pp. 393-429. These data will be treated in more detail in a forthcoming 1950 Census monograph on fertility by Wilson H. Grabill, Clyde V. Kiser, and P. K. Whelpton.

[3]D. V. Glass and E. Grebenik, *The Trend and Pattern of Fertility in Great Britain*, London: Her Majesty's Stationery Office, 1954.

[4]U.S. Bureau of the Census, *1940 Census of Population: Differential Fertility, 1940 and 1910: Fertility by Duration of Marriage*, Washington: Government Printing Office, 1947.

[5]U.S. Bureau of the Census, *1950 Census of Population: Fertility* (Vol. IV, Part 5, Chapter C). Washington: Government Printing Office, 1955.

[6]U.S. Bureau of the Census, *1950 Census of Population, Series* PC—14, No. 22. "Fertility by Duration of Marriage: 1950," September 7, 1956.

[7]This statement can be only partly supported by statistics. In the United States, native white women, 30 to 34 years old and married 10 to 14 years in 1940, had 2,280 children ever born per 1,000 women (adjusted) or 78 per cent of the 1950 rate, 2,937, for white women, 40 to 44 years old and married 20 years or more. In Great Britain, couples classified into eight social status categories, married in 1910, 1915, and 1920, had produced at 10 to 14 years duration of marriage between 94

comparable data are presented for 1940 and 1910. The 1940 data correspond to the marriage cohorts of 1925-29 and reflect primarily the fertility patterns of the depression; however, many of the women in this group had started their family building before the depression. Women married 10 to 14 years in 1910 were the marriage cohorts of 1895-99.

From the distribution of wives by number of children ever born, the number of children per 1,000 wives can be computed. This measure will be designated in this paper as the cumulative fertility rate (8).

Adjustment of Data for Comparability

One of the problems in comparing these census data concerns the different treatment in 1950 than in 1910 and 1940 of data for women for whom no report was made either on times married or on children ever born. The published 1950 census data included estimates of children ever born and of times married, when such information was not originally reported (9). The published 1910 and 1940 cumulative fertility rates were computed on the basis of reporting women. It is estimated that the 1940 rates should be reduced by 2.7 per cent, and the 1910 rates by about 2.0 per cent, to allow for the effect of excluding the relatively infertile women with no report (10). Since the proportion of women not reporting was inversely related to duration of marriage, a larger adjustment probably should be made for women married only a few years and a smaller one for women married many years. The correct adjustments may vary slightly by social and economic characteristics. However, in the absence of more specific information, uniform downward adjustments of the 1910 and 1940 fertility rates have been made in this paper.

Another problem involves the different ways in which information on duration of marriage was obtained. In 1910 and in 1950, a direct question was asked on how long the woman had been married. In 1940, information on duration of marriage was obtained in an office procedure, by subtraction of the woman's age at first marriage from her age at the census date. A woman married at, say, age 18 and who was 19 in 1940 was credited with a marriage duration of one year. Actually, if combinations of the extreme limits of age at marriage and at census were considered, the woman could have been married anywhere from one day to two years, a range centered at 1.0 years. In using data obtained by subtraction of whole years of age, it is conventionally assumed that the ends of the 2-year-range offset each other and yield the practical equivalent of data for single-year ranges, but with midpoints at anniversary dates such as 1.0 years rather than halfway between anniversary dates as in direct information on years married. It is therefore necessary to shift upward the published 1940 duration intervals by ½ year to put the midpoints on a comparable basis with data for 1910 and 1950 (11). The half-year shift results in higher cumulative fer-

per cent and 76 per cent of their completed families. The average size of completed families in Great Britain ranged from 1,750 to 4,100 children per 1,000 couples. Low total fertility was associated with a high proportion born during the first 10-14 years. Computed from Glass and Grebenik, *op. cit.*, Part II, Tables I.-1 ff.

[8]A uniform terminology on this subject has not yet evolved. Kiser, *op. cit.* (1955) uses "fertility rate" without a qualifying adjective, P. K. Whelpton (*Cohort Fertility*, Princeton: University Press, 1954) uses "cumulative birthrate," both in reference to birth cohorts. Glass and Grebenik, *op. cit.*, use "average family size" in reference to marriage cohorts.

[9]See reference cited in footnote 5, pp. 5C-12 *ff.*

[10]According to the Census of 1940, the average number of own children under 5 years old present in the household of women 15 to 44 years old without a report on children ever born was about one-fourth smaller than the corresponding number in the households of women for whom a report was made. See: U.S. Bureau of the Census, *1940 Census of Population: Differential Fertility, 1940 and 1910, Women by Number of Children Ever Born*, Washington: Government Printing Office, 1945, pp. 407 ff.

[11]This shifting can be accomplished by any one of a number of possible methods. Sprague's fifth difference osculatory formula was used.

TABLE 1

CHILDREN EVER BORN PER 1,000 WOMEN MARRIED 10 TO 14 YEARS, MARRIED ONCE AND HUSBAND PRESENT, BY MAJOR OCCUPATION GROUP OF HUSBAND AND BY YEARS OF SCHOOL COMPLETED BY WIFE, FOR THE UNITED STATES; NATIVE WHITE WOMEN, 1910 AND 1940, AND TOTAL WHITE WOMEN, 1950*

(Data based on samples)

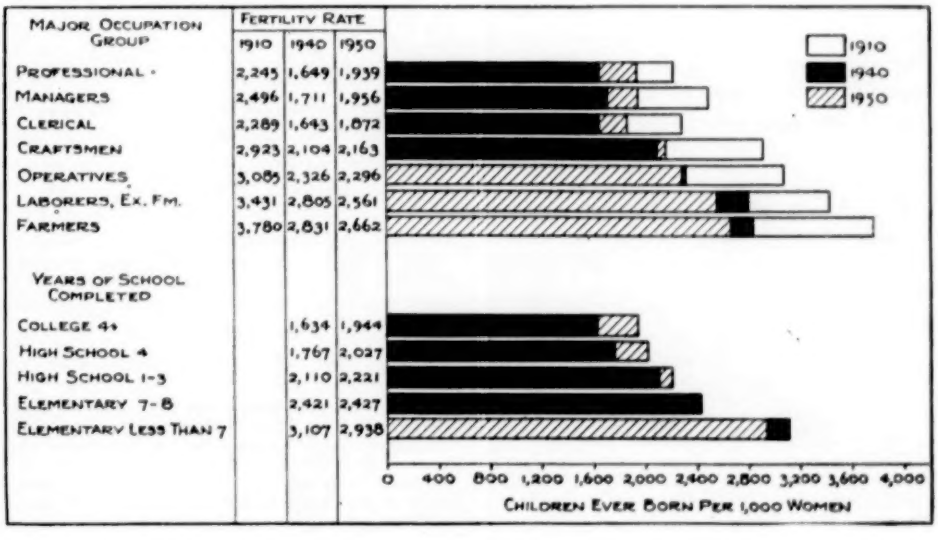
Major occupation group and years of school completed	Unadjusted		Adjusted			Per cent change (adjusted)	
	1910	1940	1910	1940	1950	1910—1940	1940—1950
Total	3,198	2,184	3,134	2,183	2,205	—30.3	+ 1.0
Professional, technical, and kindred workers	2,291	1,626	2,245	1,649	1,939	—26.5	+17.6
Managers, officials, and proprietors, exc. farm	2,547	1,704	2,496	1,711	1,956	—31.5	+14.3
Clerical, sales, and kindred workers	2,336	1,611	2,289	1,643	1,872	—28.2	+13.9
Craftsmen, foremen, and kindred workers	2,983	2,035	2,923	2,104	2,163	—28.0	+ 2.8
Operatives and kindred workers	3,148	2,248	3,085	2,326	2,296	—24.6	— 1.3
Laborers, except farm and mine	3,501	2,560	3,431	2,805	2,561	—18.2	— 8.7
Farmers and farm managers	3,857	2,801	3,780	2,831	2,662	—25.1	— 6.0
College: 1 year or more	*n a*	1,642	*n a*	1,634	1,944	*n a*	+19.0
High school: 4 years	*n a*	1,778	*n a*	1,767	2,027	*n a*	+14.7
1 to 3 years	*n a*	2,121	*n a*	2,110	2,221	*n a*	+ 5.3
Elementary: 7 or 8 years	*n a*	2,427	*n a*	2,421	2,427	*n a*	+ 0.2
Less than 7 years	*n a*	3,105	*n a*	3,107	2,938	*n a*	— 5.4

*All figures based on women 15 to 44 years old at time of census. Data include estimates of times married and number of children ever born for women with no report on these items. Data for 1940 are further adjusted by shifting marriage duration intervals ½ years upward and by distributing unemployed husbands among the major occupation groups (see text). Total line includes categories not separately shown: service workers, farm laborers, armed forces (1950), occupation not reported, not gainfully employed or not in labor force, and years of school not reported.

n a = not available.

FIGURE 1

*Children ever born per 1,000 women married 10 to 14 years, married once and husband present, by major occupation group of husband and by years of school completed by wife, for the United States; native white women, 1910 and 1940, and total white women, 1950. (Data based on samples, data for 1910 and 1940 adjusted.)


MAJOR OCCUPATION GROUP
FERTILITY RATE
1910
1940
1950
PROFESSIONAL · 2,245 1,649 1,939
MANAGERS 2,496 1,711 1,956
CLERICAL 2,289 1,643 1,872
CRAFTSMEN 2,923 2,104 2,163
OPERATIVES 3,085 2,326 2,296
LABORERS, EX. FM. 3,431 2,805 2,561
FARMERS 3,780 2,831 2,662
YEARS OF SCHOOL COMPLETED
COLLEGE 4+ 1,634 1,944
HIGH SCHOOL 4 1,767 2,027
HIGH SCHOOL 1-3 2,110 2,221
ELEMENTARY 7-8 2,421 2,427
ELEMENTARY LESS THAN 7 3,107 2,938
0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000
CHILDREN EVER BORN PER 1,000 WOMEN

tility rates for each duration group than those before the shift has been made. The adjustment thus runs in opposite direction to the adjustment for nonreports on times married or children ever born. The net effect of the two partly compensating adjustments is usually small and at 10 to 14 years duration of marriage does not exceed 0.6 per cent of the fertility rate for any educational or occupational group.

A third problem concerns the statistical treatment of unemployed persons, including persons on emergency work. In 1910 and in 1950 the unemployed were assigned to each occupation group of husbands, but in 1940 they were shown as a separate category. Moreover, the cumulative fertility rate of the unemployed in 1940 (12) was higher than the rates for any major occupation group of employed men except farm laborers. This high rate is believed to reflect mainly the increased eligibility for public emergency work of persons with large families; husbands with small families were more likely to subsist on part-time work and were, therefore, classified as employed (13). For purposes of this paper, the wives of unemployed husbands were distributed among the occupation groups on the assumption that the percentage of unemployed in each occupation group of husbands was proportionate to the percentage among all males, 25 to 44 years old, according to the 1940 Census report on usual occupation (14). It was further assumed that the fertility of each group of wives of unemployed men was proportionate to the corresponding rate among wives with employed husbands. The resulting adjustment amounted to an increase of 9.5 per cent in the cumulative fertility rate for laborers, except farm and mine, and increases of less than half that amount for the other occupation groups.

A possible fourth problem, for which no adjustment was considered necessary, involves the different race-nativity detail tabulated in the three censuses. The data for 1950 are for total white women whereas those for 1910 and 1940 are limited to native white women. In 1950, in the age group 30 to 34 years, which comprised more than half of those married 10 to 14 years, about 97 per cent of white women, married once and husband present, were native and the number of children ever born per 1,000 women was virtually the same for total whites (2,085) as for native whites (2,092).

A fifth problem, for which the data were likewise not adjusted, involves possible differences between 1910, 1940 and 1950 data in the completeness of reporting, when a report was made on children ever born. Comparison of entries on birth registration records of infants born in the first three months of 1950 with census data suggests the reporting of children ever born among white women of childbearing age is of excellent quality (15).

Because all of the data on fertility shown in this paper are based on samples of the population rather than on complete counts, cumulated fertility rates are not presented for the two smallest occupation groups for which data are customarily shown by the Bureau of the Census, *i.e.*, service workers and farm laborers.

Results and Conclusions

From 1910 to 1940 the number of children ever born per 1,000 women married 10 to 14 years declined 30.3 per cent, computed on the basis of adjusted data. In

[12]The unadjusted rate was 2,880 children ever born per 1,000 women married 10 to 14 years, compared with 2,105 for wives with employed husbands.

[13]Frank W. Notestein, "The Fertility of Populations Supported by Public Relief," *Milbank Memorial Fund Quarterly*, 14, January, 1956, pp. 37-49.

[14]U.S. Bureau of the Census, *1940 Census of Population: The Labor Force (Sample Statistics): Usual Occupation*, Washington: Government Printing Office, 1943. Tables 7 and 12.

[15]Data for aged women are not involved here. There is evidence that rates of children ever born for very old women tend to be too low, either because some children are not reported by the respondents or because the women are not representative of the larger group from which they have survived.

contrast to this decline, the cumulative fertility rate increased 1.0 per cent between 1940 and 1950, moving from 2,183 to 2,205 children per 1,000 women married 10 to 14 years. The small increase is not meaningful, considering the combined effect of sampling variability and of the adjustments made. Since the average age at marriage was about equal for brides married in 1935-39 and for those married in 1925-29 (16), the data suggest that the number of children ultimately attained by the two groups of marriage cohorts will be approximately the same. Other studies have shown a marked increase between 1940 and 1950 in the cumulative fertility of women 15-29 years old (17). This observation is not inconsistent with the findings in the present study; when considered jointly, the two sets of data show that this increase in fertility resulted mainly from increases in the proportion of women married at each age and in changes in the timing of births (18), higher proportions of women having their children at relatively young ages.

Among the major occupation groups, the relative decline in cumulative fertility rates between 1910 and 1940 was greatest among the wives of managerial workers and smallest among the wives of nonfarm laborers. It will be noted that the decline in cumulative fertility rates was greater for the population as a whole than for all but one of the major occupation groups. This apparent paradox reflects the changes in occupational structure that took place in the United States between 1910 and 1940, shifting the weighted mean in the direction of lower fertility.

Between 1940 and 1950, wives of professional, managerial, and clerical workers made substantial advances in cumulative fertility. Rates continued to decline, on the other hand, in major occupation groups that were characterized by relatively high levels of fertility, notably among the wives of laborers and farmers. As a result, the range of differential fertility was reduced in 1950 as compared with 1940.

Changes between 1940 and 1950 in cumulative fertility rates in terms of years of school completed by the wife presented a pattern similar to that found for the major occupation groups. The number of children ever born per 1,000 married women increased 19.0 per cent for those with one or more years of college and by a progressively smaller percentage for those with fewer years of school completed. The fertility rate of women with less than seven years of elementary school declined 5.4 per cent.

In summary, then, the principal results of our analysis are the following: The average size of family for the white population of the United States, as reflected by the number of children born during the first 10 to 14 years of marriage, remained approximately stable between the marriage cohorts of 1925-29 and those of 1935-39. Fertility differentials between socio-economic classes, defined in occupational or educational terms, were substantially reduced.

[16]Among those 25 to 49 years old and married 10 to 14 years, the median age of white women, was 33.85 years in 1950, compared with 33.68 years for native white women in 1940. See references cited in footnotes 5, Table 18, and 4, Table 17.

[17]See, among others, Whelpton, *op cit.*, and Kiser, *op. cit.*, (1955).

[18]Norman B. Ryder, "Problems of Trend Determination during a Transition in Fertility," *Milbank Memorial Fund Quarterly*, 34, January, 1956, pp. 5-21.

TRAITS, FACTORS, AND GENES*

WILLIAM R. THOMPSON
Wesleyan University

IN THIS PAPER I WOULD LIKE to discuss in some detail a problem basic to progress both in the field of psychology and in the field of behavior genetics. This is the question of finding rational units of behavior or unit traits that can be measured independently, and whose genetic causation can readily be traced. Several ways of approaching the problem will be examined, especially the method of factor analysis, and suggestions will be made regarding the possible relationships between traits, factors, and genes.

THE COMPLEXITY OF TRAITS

We may note, first of all, that so-called "molar" behavior, commonly studied by psychologists, whether by means of rat mazes or by means of psychometric tests, is highly complex. Usually it involves a number of components which are confounded in any single score used to represent it. For example, the exploratory activity of animals, behavior that one might suppose to be simple and basic, is probably extraordinarily complicated. My own observations of it in the mouse (18, 20) and in the rat (22, 23) give me the feeling that it should be broken down into much finer units if its genetic background is to be studied adequately. Similarly, at the human level, a test like the Stanford-Binet, while it is very popular and useful, uses essentially a "shotgun" approach to the problem of measuring intelligence by incorporating a wide variety of sub-tests, each of which probably measures a different aspect of intelligence as well as a common factor (2). It is all very well to say that it works. But this should not be enough for those interested in a genuinely scientific approach to the definition and measurement of behavior. To deal effectively with psychological traits, we must be able not only to identify their essential dimensions and construct tests that measure these exclusively but also to relate these dimensions to suitable independent criteria. Only in this way will there be any possibility of developing a coherent description of behavior from which we may proceed to the study of its inheritance.

THE PROBLEM OF TRAIT DIMENSIONS

At least two main approaches have been made to the problem of specifying unitary behavior traits. One is an *a priori*, the other essentially an *a posteriori* method. The first of these can best be exemplified by the so-called "culture free" test. Observing the need for tests that are independent of culture variables and really measure abilities in their most essential form, a number of workers such as Cattell, Raven, Rulon, and others (2) have attempted to construct tests on which performance will not be affected by such environmental factors as education, upbringing, and local customs. These tests are composed of items that are supposedly either new or common to all cultures while still requiring what is hypothesized to be basic intellectual ability. Now while such tests may have some usefulness, it is unlikely that they are entirely culture-free and really get at a unitary intellectual process common to mankind. Numerous anthropological and sociological observations indicate quite clearly that even the way people look at and think about the world can be profoundly influenced by the culture in which they live. It is likely, for example, as Carrothers and others (4, 15) have implied, that the reasoning processes

*I acknowledge with thanks the criticisms and suggestions made by D. Bindra, G. A. Ferguson, D. O. Hebb, and F. C. Fraser of McGill University, J. L. Fuller of Hamilton Station, E. Caspari of Wesleyan University, and Gardner Murphy, Menninger Foundation.

of the average European and the average East African native are so entirely different that the two cannot even be adequately compared on the same scale. This being so, it is very doubtful whether the culture-free test is getting at anything we might label "pure intelligence" in its most unitary form. Furthermore, I rather doubt that such an approach will be successful in its aims, at least in the near future. From an *a priori* point of view, we can never really be sure that what we are trying to measure is really unitary and elementary. Much empirical work will first be necessary on the influences that can exert effects on the organism early in life before there will be any hope of finding some common base line or base lines of intelligence.

More promising is the *a posteriori* approach represented by factor analysis. It is to the great credit of those who have developed it that their specific aim has been to find basic dimensions of behavior. Thus Thurstone and many others have been able to offer parsimonious descriptions of a number of psychological domains, including intelligence, perception, temperament, and personality. These domains, or areas of behavior, at first only describable by means of a large number of experimentally independent tests, are eventually defined as the result of the analysis in terms of a few unit factors of which any one of the single tests is a function. The application of these techniques, laborious though they may be, has represented an enormous step forward in scientific sophistication. Unfortunately, there is one major difficulty involved. The great problem remaining is that of specifying which of the many methods of analysis available yields the most meaningful factorial solution.

To date preferences as to method have been somewhat arbitrary. For example, as Vernon has pointed out (26), English factor analysts, following Spearman's lead, have usually described their tests in terms of a general factor plus specifics; while American workers, after Thurstone, have tended to prefer multiple factor solutions. Clearly, this is not a problem that is unique to factor analysis. In constructing any psychological test, the psychometrician must somehow decide which kinds of items are most meaningful to his purpose. Usually such a decision is made partly on an *a priori* basis and partly on the basis of the correlation of the test items with various criteria that are considered relevant. As in the case of factors, this procedure is bound to be rather uncertain. We can hope, for example; that an intelligence test really measures intelligence, but at present we can do little more than define intelligence in terms of the test itself.

The obvious question that arises at this point is whether any method can be found of specifying meaningful criteria for traits and factors. A parsimonious description of behavior by itself is not enough. It is desirable to have as well some means of knowing which of the possible factor solutions that can be obtained are the most meaningful, particularly, from the standpoint of the present paper, in relation to biological and genetic criteria.

THE CRITERION PROBLEM IN FACTOR ANALYSIS

Several approaches to the general problem of choosing a best factorial solution have already been attempted. One of the most celebrated of these is embodied in the "simple structure" concept of Thurstone (24). As Ferguson (7) has pointed out, this concept is based ultimately on the law of parsimony. When rotation produces a solution that is intuitively simple and psychologically meaningful, then this solution is regarded as particularly compelling. On account of some disadvantages inherent in the simple structure idea, however, Ferguson has attempted an ingenious explication of the criterion of parsimony by relating it to entropy in statistical mechanics and to information in communication theory. Rather than referring to "simplicity" merely, parsimony is now taken to refer to "degree of organization" or "degree

of lack of randomness" of a test configuration.

This approach may well represent a genuine theoretical advance insofar as it indicates a more exact criterion for the meaningfulness of factors. It must be noted, however, that it tells us little about the relation of factors to any external criteria. The criterion used to justify this method of solution and the factors obtained is internal rather an external, and is mathematical rather than empirical. It is, of course, possible that there is some isomorphism between the mathematical and biological properties of factors. Factors which are maximally organized in a statistical sense may turn out to make the most sense biologically or genetically. At present, however, we have no way of knowing whether this is true or not.

Somewhat more to the point, perhaps, have been the approaches of Halstead (9) and of Eysenck (6). By using for his correlation matrix tests which reflect brain damage, Halstead has obtained four factors which he considers to represent different aspects of biological intelligence. This is a promising approach. But it should be pointed out that, assuming the validity of his study, it is Halstead's tests rather than his factors that make sense biologically. The actual factoring was done by conventional methods, and there are no *a priori* grounds for supposing that the factors so obtained best represent biological reality. Criteria should be sought not only at the level of testing, but also at the level of rotation.

In this respect, the procedures employed by Eysenck are more satisfactory. Basically, Eysenck's method, called "criterion analysis," involves the selection of factors that agree maximally with some criterion test or tests included in the correlation matrix. These criterion tests represent, as it were, psychological hypotheses about the nature of the domain under consideration, so that when a configuration is selected in accordance with them, then it is presumed that this configuration makes some psychological sense. In this way, factors that maximally reflect heredity can be chosen by inserting an appropriate criterion in the test matrix. While the mechanism of the technique is of little concern to us here, its general rationale is of considerable importance, since it represents a genuine attempt to relate factors to psychological and biological facts arrived at independently. At the same time, it cannot be said that the method has yet been fully exploited, particularly in relation to the criteria used. There is clearly a need to explore more fully the criterion question, so that the essential nature of psychological factors and their relation to biological reality can be elucidated.

The approaches described above clearly do not solve the problem of choosing meaningful factors. At the same time they do suggest lines of attack that may eventually be successful, and they are worth following up for that reason. This brings us directly to the main issue with which this paper is concerned.

Whatever its present limitations, factor analysis is a method *par excellence* for specifying unit traits. The question we may now ask is this: Given a number of factors, what meaning can they have in terms of genetics? By examining this problem in some detail, we may be better able to assess the value of factors and unit traits in the study of behavior inheritance. Furthermore, we may also find ways in which genetics can furnish criteria for the selection of meaningful factors.

THE GENETIC MEANING OF FACTORS

The first point to emphasize is that psychological factors are inferred from correlation coefficients. A factor is simply a shorthand description of the fact that certain tests intercorrelate more highly with each other than with other tests. Consequently, to understand the relation between factors and genes, it will be first necessary to consider what possible meanings a phenotypic

correlation between two traits may have genetically. At this stage, no assumptions are made concerning the effect of environment or the specificity of the traits. We may start merely with an empirical correlation between two experimentally independent tests and ask the question—what could this correlation mean in terms of genetics?

As Lerner (10) has pointed out, there appear to be at least four kinds of communality that could be responsible for the correlation. I have labeled these *chromosomal communality, gene communality, selection communality* and *environmental communality*. Each will be discussed in turn.

1. Chromosomal communality refers to genetic linkage. That is to say, the correlation may mean that the genes representing the two traits are linked by virtue of being located on the same chromosome or chromosomes. The phenotypic effects of linkage may be illustrated by a simple example from maize genetics (14). It is known that the two seed characters, "shrunken" and "colorless," and their opposites, "full" and "colored," are correlated in a non-randomly breeding population with high homozygosity. The fact was ascertained, however, not by measuring many seeds with respect to the two parameters and then calculating a correlation coefficient on the observed values, but by crossing the two types, colored-full and colorless-shrunken, and counting the frequencies of parental combinations and recombinations in the F2. It was found that the number of parental types (colored-full and colorless-shrunken) greatly outweighed the number of recombinations (colored-shrunken and colorless-full). In other words, the two traits showed, at the phenotypic level, a correlation which represented linkage at the genotypic level. Linkage, we know from cytological evidence, means that the genes representing the traits lie on the same chromosome and that the physical distance between them varies directly with the proportion of parental combinations to recombinations in the F2—that is to say, with the magnitude of the phenotypic correlation (in this case, tetrachoric) between the two characters, shape of seed-pod, and color of seed-pod. The general case of chromosomal communality is shown diagrammatically in Figure 1.

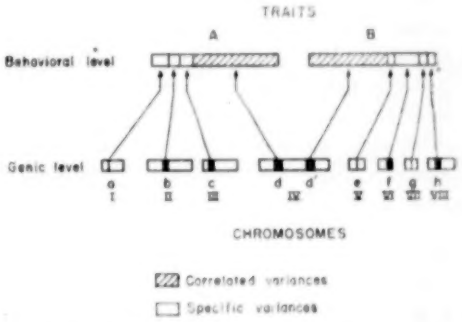


FIGURE 1—A CASE OF CHROMOSOMAL COMMUNALITY. It is assumed that traits A and B are made up of variances specific to each and a variance common to both. The specificity arises from genes, *a, b, c, e, f, g, h,* lying on different chromosomes, I-III in the case of trait A, V-VIII in the case of trait B. The covariance arises from the fact that genes *d* and *d'* both lie on chromosome IV and tend to assort together. Consequently, the traits vary together in magnitude in the same individual to the degree that the genes *d* and *d'* are linked.

It is possible that some psychological factors reflect genetic linkage. Let us suppose that Factor I represents the intercorrelations between several tests in a matrix, and that the abilities or traits measured by these tests are carried by a number of genes whose effects need not be equal and additive. It may happen that the genes contributing to a certain degree of ability in one test are linked with the genes that contribute a corresponding amount to the abilities required by the other tests. That is to say, the genes that give a person a score, let us say, of two standard deviations above the mean of the population on Test 1 are located on the same chromosomes as those genes that produce in combination

a correspondingly high score on the other tests. In such a case, obviously, the probability is greater than chance that a person who has a high score on Test 1 will have a high score on the other tests. Other things being equal, Factor I will represent this covariation in genes, and hence scores, for all the tests with respect to each other. The agent responsible for this covariation will be the chromosome.

It should be mentioned, however, that rather special conditions are required for the operation of this case. The effects of linkage are maintained only in a non-randomly breeding population. To illustrate this, we may return to our first example. It will be recalled that the model used involved a mating between two parents in which the traits were linked—that is, between the types colored-full and colorless-shrunken. With such a mating, a predominance of parental combinations appear in the F2. However, if mating subsequent to the F2 becomes random, so that there is an equal probability that any genotype will mate with any other, then the frequency of parental types in ensuing generations will diminish rapidly as the population approaches equilibrium. In the long run, the occurrence of crossing-over will build up the frequency of recombinations to a level equal to that of the parental combinations, so that, ultimately, the phenotypic correlation between the characters will vanish. As against this, at least two conditions may serve to maintain the correlation. One is the proximity of the genes concerned. If they are very close together on the same chromosome, crossing-over may be so rare that the phenotypic correlation will not be abolished so quickly. Secondly, there may be some selection pressures in the environment that favor mating of parental types or that favor the viability of their offspring. For example, if anxiety and rigidity were linked traits, a preponderance of matings between anxious, rigid persons and non-anxious, non-rigid persons would serve to retain the linkage. This would certainly require a very special set of circumstances. But if we consider the importance of social customs and mores and the extent of their influence on human behavior, perhaps we may be willing to admit that such circumstances could arise. In such a case, however, it would be most difficult to know whether the effects were due primarily to linkage or to selection.

2. The second meaning that a correlation may have, genetically, is that the two traits are each carried by one or more genes, some or all of which are common to both traits. Since genes rather than chromosomes are responsible for covariation here, I use the term "gene communality." Essentially, this is genetic pleiotropy, and it is illustrated quite well by the so-called Ellis-van-Crevald syndrome in which a number of abnormalities (dwarfism, ectodermal defects, polydactyly and others) all result from the action of one or a few recessive genes (12). The abstract case is diagrammed in Figure 2a. Whether there is really such a thing as true genetic pleiotropy is debatable. More common is physiological pleiotropy, exemplified by albinism, and illustrated in Figure 2b. In this syndrome, a single recessive gene produces lack of pigmentation—a single physiological effect which itself has a number of ramifications, such as pale skin, pink iris, light hair, oversensitivity to light, and others. It is quite possible that many psychological correlations and factors represent one of these kinds of pleiotropism. Perhaps it was something like physiological pleiotropy that Spearman had in mind when he called his G factor "general mental energy" (16).

3. The third genetic meaning of a correlation to be discussed is perhaps the most interesting and perhaps also the most plausible. In this case, covariation of two or more traits depends not on any genetic or chromosomal communality but entirely on selection pressures in the population. For this reason, it has been labeled "selec-

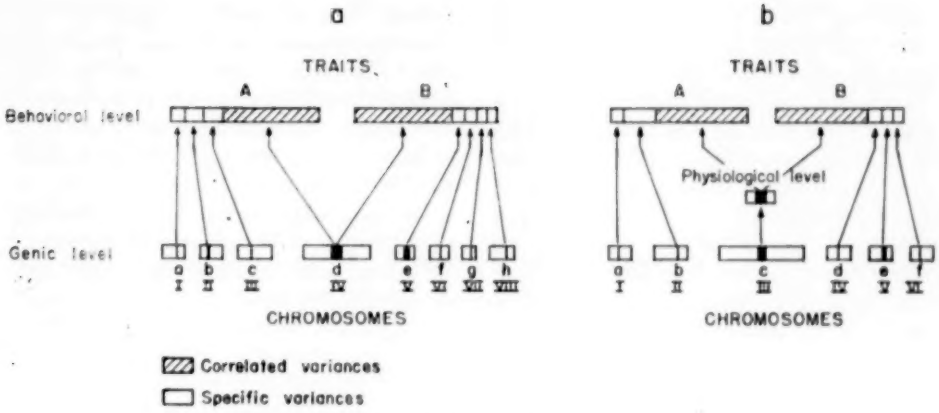


FIGURE 2—A CASE OF GENE COMMUNALITY. In *2a*, the pleiotropic gene (*d*) results in covariation in the two traits A and B. In *2b*, a physiological effect arising from one or a few genes (*c*) has correlated effects on both trait A and trait B.

tion communality." It is a known fact that mating in human populations is often homogamous rather than random. That is to say, people tend to marry others like themselves. The most obvious example of a trait for which this occurs is intelligence, and Conrad and Jones (5) have calculated that the homogamy coefficient for intellectual ability is of the order 0.50. Now it may also happen that when two traits (in the simplest case) assume cultural value and correlate with various cultural variables (*e.g.*, socioeconomic status), individuals who are high in one trait will tend to mate with individuals high in the other trait, but randomly with respect to the same trait. This kind of mating is called cross-homogamous, or more correctly, cross-homophenogamous. Under such mating conditions, it is obvious, as Price (13) and Bartlett (3) have shown for the general case, that a correlation will be generated between the traits, even though they were uncorrelated to start with and completely independent genetically. A simple illustration of selection communality is diagrammed in Figure 3.

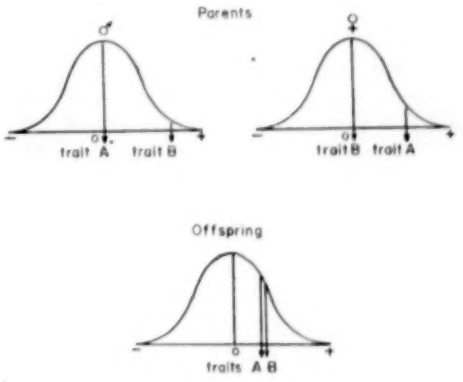


FIGURE 3—A SIMPLE CASE OF SELECTION COMMUNALITY. A and B are uncorrelated ability-traits. Thus an individual high in B may be low, medium, or high in A, though *on the average*, he will be medium. The same applies to trait B with respect to A. If inheritance is polygenic and involves equal and additive genes, the F1 will be about halfway between the parents in both traits. This means that the traits will coincide or correlate in the offspring.

To give a concrete example, let us suppose that we are dealing with a population of university graduate students each possessing a number of independent and un-

correlated abilities. Let us also suppose that each individual is majoring in a subject for which he or she is especially well equipped by virtue of high endowment in one of these abilities, and also that matings tend to be inter-departmental rather than intra-departmental. Under such conditions, a male student who has, let us say, a high degree of ability in classics (assuming this is a unitary ability) may mate with a female student who has a high degree of ability in psychology (also assumed to be a unitary ability). Since the two traits are initially uncorrelated, the ability of each student in the other's field of specialization may be high, low, or medium. As far as each individual is concerned, the ability of the other in the secondary trait is random, which means that, on the average, it will approximate the mean of the whole population. Assuming polygenic inheritance and absence of dominance, their children, on the average, will possess each trait to a like extent (midway between the parental scores), depending on the value of the coefficient of cross-homogamy. In other words, ability in classics and ability in psychology will be correlated in the next generation. If this kind of mating is general, then the correlation will increase in subsequent generations, and the number of individuals who still show discrepancy between their ability in each trait will become smaller and smaller. It will readily be seen that the closer the correlation approximates 1.0, the more irreversible will the process be. If there are no individuals in whom the two abilities are uncorrelated, then they will inevitably be linked in that population. With a large number of such unit abilities, the same kind of selective mating will eventually give a general factor. However, such a factor will have no counterpart whatsoever at the genic level. It results entirely from selection.

I would hazard a guess that a good many psychological traits are precisely like this, and are mere cultural artifacts, or, one might say, artifactors. Conversely, it is also possible that the lack of significant relationship between tests in some domains is due to the lack of selective matings with respect to that domain. It is interesting, for example, that motor skills do not seem to intercorrelate very highly in our culture (2, 17). Perhaps, were our society of such a character that motor abilities assumed great prestige value and became correlated with social position, then it is possible that the correlations between separate skills pertaining to the domain might increase strikingly in magnitude.

It might appear that cross-homogamous matings would be rare in practice. But it is the writer's opinion that, on the contrary, they are rather common. Psychologically, most people do not deliberately seek out a mate who is high in some abilities other than the ones in which they themselves are high. Usually they simply choose someone of about the same ability, or perhaps someone outstanding in an ability they value. But the important thing to remember is that their choice is broad and subjective, and is not usually based on the prospective mate's objective performance on a battery of aptitude tests. Thus, John Smith, who is a capable mathematician, may choose Mary Jones as a wife not specifically because she is a competent philosopher but merely because she appears to him generally intelligent and is a university graduate. Thus, if we recognize that the dimensions of human ability and personality *as judged* are rather broad but that these same dimensions may *in reality* be composed of a number of separate components, then it will be clear that, more often than not, mating will actually be cross-homogamous, with the results described above.

4. The three cases described above represent, very broadly speaking, genetic interpretations of psychological correlations or factors. The final possible interpretation is non-genetic. Given two traits that are genetically independent, they may become correlated if environmental factors

exert pressure on each (10). This case we may call "environmental communality." It is assumed, of course, that the traits involved are ones for which some nongenetic variation is possible. Relatively stable traits, such as pigmentation or other physical characters, are not easily changed in the individual. On the other hand, we have now plenty of evidence to indicate that many psychological traits can readily be altered by imposing different kinds of environmental conditions on the organism, particularly in early life. If two traits are radically effected by such conditions, then a correlation will be generated between them. For example, it has been found that dogs reared in conditions of severe perceptual isolation show later in life lowered ability in problem-solving on one hand, and hyperactivity on the other hand (19). Thus, activity and intelligence become correlated (negatively) in this particular population due to a common environmental influence. It is not difficult to imagine how correlations between various traits and abilities in human beings may be generated in the same manner. Such syndromes of correlated traits as in the "authoritarian personality" (1), or in the "high achiever" (11) may well represent the effects of certain forces in the family and in society, exerting an influence on characters that have no genetic relationship to each other.

IMPLICATIONS

I have outlined above four interpretations that may be given to psychological factors from the standpoint of heredity and environment. Rather than solving our problems, however, it is clear that this analysis gives rise to many new ones.

In the first place, it is evident that we must find some methods for deciding which interpretation applies in the case of any particular factor or set of factors. Appropriate techniques are available (10, 14), but their application in the present context will certainly not be simple. Secondly, supposing we are able to decide what a certain factor means, what inferences can we then draw about correlations between factor analysis and the genetics of behavior? I indicated before that factor analysis, since it breaks down complex behavior into simple units, should prove a useful tool for studying the inheritance of behavior. It would now seem, however, that its usefulness may be limited depending on the kind of communality that underlies a certain factor. Factor methods will always give us parsimony at the behavior level. But they will not always do so at the genetic level. Thus, factors representing selection or environmental communality will, in all likelihood, have just as complex a genetic basis as the separate tests whose intercorrelations they represent. In these cases, we must conceive of the bases of abilities and traits as being, as Tolman (25) has put it, "multitudinous, highly specific, and relatively narrow." Covariations may be built up either through differential mating patterns or through such environmental effects as learning and transfer (8). With chromosomal communality much the same holds true. Although we have here a more incisive relationship between the behavioral and the biological level, the factors in this case do not necessarily represent a gain in parsimony at the genetic level. Only in the case of genetic communality, in fact, can we expect such a gain. Many common factors may well represent common genes, so that there is a isomorphism between the two levels. Whether this represents the rule or the exception is, at present, difficult to say. Only empirical work will provide the necessary answers.

It was suggested not only that factor analysis may be useful for psychogenetics but also that we might possibly find in genetics some criteria for choice of meaningful behavioral factors. Our discussion of the meaning of factors certainly does not supply any ready answers to this question. At the same time, perhaps it does indicate that such a possibility does exist. We have

in formal genetics and in factor analysis two closely analogous methods. In the first, we attempt to explain the characteristics of a population (usually an F2) by means of a few biological constructs, that is to say, genes, and there is a fairly exact relationship between the number of types that appear in the F2 and the number of alleles involved. Factor analysis has a very similar aim, insofar as it is a way of reducing a large number of traits to a few underlying unities. The path from characters to genes seems closely analogous to the path from characters to factors. How this analogy can be satisfactorily explicated so that the methods can prove mutually useful is a problem that cannot be developed in this paper. To my mind, there is little question that this can be done. What we wish to find are unit traits that have not merely a definite genetic basis but also a genetic basis that is as simple as possible. If techniques can be found that bring out such an isomorphism between the behavioral and the genetic levels, they should prove very valuable both to factor analysis and to psychogenetics.

REFERENCES

1. Adorno, T. W., Frenkel-Brunswik, Else, Levinson, D. J., & Sanford, R. N., 1950. *The Authoritarian Personality*, Harper, New York.
2. Anastasi, A., 1954. *Psychological Testing*, Macmillan, New York.
3. Bartlett, M. S., 1937. Note on the development of correlations among genetic components of ability. *Ann. Eugenics* (Cambridge), **7**: pp. 299-302.
4. Carothers, J. C., 1951. Frontal lobe and the African. *J. Ment. Sci.*, **97**: 12-48.
5. Conrad, H. S. and Jones, H. E., 1940. A second study of family resemblances in intelligence: environmental and genetic implications of parent-child and sibling correlations in the total sample. *Yearbk. Nat. Soc. Stud. Educ.*, **39**: (II): 97-141.
6. Eysenck, H. J., 1950. Criterion analysis—an application of the hypothetico-deductive method to factor analysis. *Psychol. Rev.*, **57**: 38-53.
7. Ferguson, G. A., 1954. The concept of parsimony in factor analysis. *Psychometrika*, **19**: 281-290.
8. Ferguson, G. A., 1954. On learning and human ability. *Canad. J. Psychol.*, **8**: 95-112.
9. Halstead, W. C., 1947. *Brain and intelligence: a quantitative study of the frontal lobes.* Univ. of Chicago Press, Chicago.
10. Lerner, M. I., 1950. *Population Genetics and Animal Improvement.* Cambridge Univ. Press, Cambridge.
11. McClelland, D. C., *et al.*, 1953. *The achievement motive.* Appleton-Century-Crofts, New York.
12. Metrakos, J. D. and Fraser, F. C., 1954. Evidence for a hereditary factor in chondroectodermal dysplasia (Ellis-van-Creveld syndrome). *Amer. J. Hum. Genet.*, **6**: 260-269.
13. Price, B., 1936. Homogamy and the intercorrelation of capacity traits. *Ann. Eugenics (Cambridge)*, **7**: 22-27.
14. Sinnott, E. W., Dunn, L. C., and Dobzhansky, T., 1950. *Principles of Genetics.* McGraw-Hill, New York.
15. Smartt, G. G. F., 1956. *Mental maladjustment in the East African. J. Ment. Sci.*, **102**: 441-466.
16. Spearman, C., 1927. *The abilities of man.* Macmillan, New York.
17. ————— and Jones, W. L., 1951. *Human Ability.* Macmillan, London.
18. Thompson, W. R., 1953. The inheritance of behavior: behavioral differences in fifteen mouse strains. *Canad. J. Psychol.*, **7**: 145-153.
19. ————, 1955. Early environment—its importance for later behavior. *In* Hoch, P. H. and Zubin, J. (Eds.), *Psychopathology of Childhood.* Grune and Stratton, New York.
20. ————, 1956. The inheritance of behavior: activity differences in five inbred mouse strains. *J. Hered.*, **47**: 147-148.
21. ————, 1957. The significance of personality and intelligence tests in the evaluation of population characteristics. Thirty-third Annual Conference of Milbank Memorial Fund: Symposium. New York. (in press)
22. ————— and Solomon, L. M., 1954. Spontaneous pattern discrimination in the rat. *J. Comp. Physiol. Psychol.*, **47**: 104-107.
23. ————— and Kahn, A., 1955. Retroaction effects in the exploratory activity of "bright" and "dull" rats. *Canad. J. Psychol.*, **9**: 173-182.
24. Thurstone, L. L., 1947. *Multiple-factor analysis.* Univ. of Chicago Press, Chicago.
25. Tolman, E. C., 1951. *Collected papers in psychology.* Univ. of California Press, Berkeley, Ch. 18.
26. Vernon, P., 1950. *The Structure of Human Abilities.* Wiley, New York.

FAMILY PLANNING AMONG JAPANESE ON PUBLIC RELIEF

Yoshio Koya, M.D.*
Nippon University
Tokyo, Japan

The Population Problem Council established in the Japanese Cabinet made the following recommendations on November 29, 1949:

> In order to prevent a sharp increase in the population which will have adverse effects on the economic reconstruction and promotion of public health in this country, and to bring a sound cultural life to realization, it is considered necessary to furnish married couples with necessary information on contraception by teaching reasonable methods and to give guidance of conception control to all classes of our nation so that married couples can regulate the number of births freely and voluntarily by means of conception control.

Here we will discuss family planning in Japan in regard to a specific point in the above statement: *"to give guidance of conception control to all classes of our nation."*

Why did the Population Problem Council recommend such a matter to the Japanese Government? It did so obviously because it feared that the average quality of the next generation would certainly deteriorate if conception control were practiced faithfully only by a certain class of people, while other classes showed little or no interest. This is not to say that the Council had sufficient concrete knowledge to say with confidence in which class more children were desired and in which the number of offspring should remain small. Behind the statement lay the belief that the danger mentioned above might be averted to a certain degree if conception control were spread equally among all classes.

Seven years have elapsed since these recommendations were issued, but it is all the more important today to consider the specific recommendations for guidance in conception control. The strongest reason for this is the great decrease in the Japanese death rate in recent years. The rate was as low as 7.8 in 1955, a rate almost equal to, or perhaps even lower than, the occidental low level. Decrease in infant mortality is particularly conspicuous. If present conditions continue, of a hundred newborn infants only 3.9 would die before their first birthday. Also the death rate during the earlier years of life has been lowered considerably. As a result only 7 to 8 per cent of girls born would die before they reach marriageable age and the remaining 92 to 93 per cent would mostly participate in the reproduction of the next generation through marriage.

Comparison here between the present situation and that of the prewar years is interesting. If we review the life table for 1935, we note that of a hundred newborn infants, more than 10 were dead before their first birthday and 25 to 26 failed to reach marriageable age.

The real significance of these developments, as Frederick Osborn has pointed out, is the fact that death can no longer exert a selective influence. And, if it can no longer do so, then birth becomes the important factor instead. In other words, the average quality of the next generation today depends more upon this: which class with what quality has a higher birth rate than others?

*An article in Japanese on this material appears in the *Japanese Medical Journal*, No. 1692, September 29, 1956. Dr. Koya was assisted by Drs. H. Kubo, M. Muramatsu, S. Yuasa, H. Ogino, and S. Agata.

When we examine closely the present status of the dissemination of family planning practice in Japan with special attention to quality not a few problems are found. The most important is that family planning has become widespread very rapidly only among the intellectual class and is not easily disseminated among extremely poor people.

In saying this, I am not trying to imply that the poor are inferior as to quality, of course. As our study has clearly revealed, a person's poverty has nothing to do with his qualitative characteristics, especially in Japan today. There are a number of families who have become extremely poor because of financial difficulties due to war damages or to the rapid postwar changes in social institutions. Also many have been brought to their present misery because of disease, notably tuberculosis, which has deprived them of the means of subsistence.

Despite all these reservations, however, I cannot but look on the present situation with anxiety where the practice of conception control is thus unsatisfactorily disseminated among a particular class of people, with the result that many unwanted children are born year after year. It is hard to believe that leaders of future Japanese cultural development could be produced from among children born unwanted, poorly educated, and raised in undesirable circumstances. No doubt some are endowed with superior genetic quality even among them. But obviously it is not easy for such quality to develop to the full if their surroundings remain unfavorable. This is not simply common sense but is well supported by scientific evidence.

In view of these considerations, the Japanese Government recently has taken a step forward to enforce a program for dissemination of contraceptive practice among the extremely poor. This may well be called a timely action on the part of the Government. However, the actual enforcement of the program seems to have met unexpectedly with various difficulties and the results so far are not so good as anticipated. Yet this program by all means must not only be enforced but carried out successfully.

An Experiment and Survey in Family Planning

With a view to contributing to the planning of such a conception control program, we started an experiment and survey in April 1953 with those who were receiving public relief from the Japanese Government. The experiment is now in its fourth year, and data for the third year have become available recently. Here the results of the experiment will be described, using chiefly the findings of the third year.

Our experiment was an intensive educational program in family planning in a specific test area, and our survey was a nation-wide one of families receiving public relief. For the experiment, 418 families were chosen in 9 districts of Katsushika Ward, Tokyo. For the survey 1,789 families were chosen in 63 districts extending from Hokkaidō to Kyushū. The present report is concerned mainly with the educational experiment in family planning. A mass of material is contained in the nation-wide survey which does not permit satisfactory reporting here, but a few of the results will be referred to for the purpose of comparison.

Composition of the population: The selection of the 418 families for the experiment was made under certain conditions. The first was that no family be included in which the wife was 50 years old or over. Secondly, the husband and wife must be living together. As a result extremely few old people were included and there were sharp age indentations between 20 and 40 years of age. In this population of 418 families, the average age of husband has been computed to be 43.3 years, and that of wife, 36.9. Similar results appeared in the nation-wide survey of families on public relief, namely, 41.7 and 35.3 years, respectively, for the husband and wife.

Circumstances before and after public relief: Through investigation we intended to learn the reasons, direct or indirect, for these families receiving public assistance.

Our first inquiry was concerned with time of arrival in this area. Of the 418 families, 260, or 62 per cent, moved into the area after 1943. Especially numerous were the families who settled during 1944 and 1945 when the air raids were most severe. Most of the families were driven into the area, having been deprived of their homes and property.

The unemployed, of whom there had been none before relocation, numbered 162, or 39 per cent. Factory workers or workmen had decreased to about one-third, clerks to about one-fifth, and shopkeepers or peddlers to less than one-third. Increases were shown in laborers, odd-job men, and ragmen.

Most of the unemployed at present have had only elementary or middle-school education, but even here there are 14 families with husbands graduated from colleges or universities. Also 3 husbands reported to be college graduates are working as laborers or odd-job men. These findings show that unusual changes have occurred in these families' circumstances since the end of the war. What caused them to fall to their present circumstances? According to our investigation the answer is simply disease of one kind or another. Of the 418 husbands under observation, only 157 can be regarded as healthy or normal. The remaining 261, or 62 per cent, are either actually suffering from disease or are unwell. Of the diseases reported, the most important was tuberculosis, with an incidence of 40.0 per cent.

Inquiries were made of these families as to their income status as well as their housing conditions. Actual earnings of their own differed considerably from one family to another, but as many as 162 families had no employment at all, and their average monthly income was only 4,879 yen, or about $13.6. To supplement this, on the average 4,541 yen comes from the national treasury, making a total monthly income for these families of 9,420 yen, or approximately $26.2.

These findings are in accord with the income of the 1,789 families in the nationwide survey, where the average own income was 5,085 yen and average Government assistance 4,017 yen, making a total monthly income of 9,102 yen, or $25.3. It is most difficult to imagine how such families with perhaps as many as 5 or 6 members can live within such a low income.

Information about housing conditions in these 418 families is also of interest. Those with only one room numbered 192, or 46.0 per cent, while those with two rooms numbered 155, or 37.1 per cent. Few families could afford more than two rooms. As many as 5 or 6 persons have to live in this limited space, and the inconveniences and health hazards of such crowded quarters are beyond imagination. It was found that 27.9 of all the deaths in this group were due to infectious disease. In some of the homes children were frequently seen crowded together in a small room with a tubercular mother in the bed. And 44.3 per cent of all the couples shared the same bedroom with children over ten years of age, with consequent undesirable effects upon the sex education of the children.

Reproductive activities: In order to institute an intensive educational program of family planning among these families, it was necessary for us to know their previous reproductive histories and the possibilities of their accepting our teaching in family planning. Our investigation included the number of pregnancies, natural miscarriages, induced abortions, child deaths after birth control, and living children.

Table 1 is a summary presentation of information obtained and tabulated on consultation cards. We found it particularly valuable to keep such cards at the time of personal interview, giving full details about previous pregnancies and deliveries, as well as the condition of living children.

TABLE 1

Number of Pregnancies	0	1	2	3	4	5	6	7	8	9	10	11	12	Total	Average per Family	Average of 1789 families
Number of Families	14	27	43	71	81	70	44	35	18	8	5	1	1	418		
Total Number of Pregnancies in All Families		27	86	213	324	351	264	247	145	72	50	11	12	1802	4.4	4.5
Number of Natural Miscarriages			1	5	16	20	16	15	9	3	6			91	0.2	0.4
Number of Induced Abortions			6	14	18	22	32	22	20	19	9	1	3	166	0.4	0.3
Number of Child Deaths			4	23	9	24	21	31	14	11	6	1	3	147	0.4	0.3
Number of Living Children		27	75	171	281	285	195	179	102	39	29	9	6	1398	3.3	3.7

Table 1 shows that each family on the average has recorded 4.4 pregnancies, 0.2 natural miscarriages, 0.4 induced abortions, and 0.4 child deaths after birth control, the number of living children per family being 3.3. If these figures are compared with those obtained in the nation-wide survey of 1,789 families, interesting observations can be made. The average number of pregnancies differs very little between the two, but in the nation-wide group more natural miscarriages and fewer induced abortions are found, since it includes some rural population. The number of living children in the nation-wide survey exceeds that of the 418-family group by 0.4.

Readiness to accept family planning education: Before initiating our educational program, we investigated their readiness to accept such a project: the extent to which they actually wanted to learn about conception control. The results shown in Table 2 were almost completely opposite to what was generally believed. It had been thought that people belonging to this social class were very indifferent to conception control or family planning, and consequently would be the most difficult group to handle. On the contrary, it was discovered 63.1 per cent, or 264 out of the 418 families, actually wanted our teaching. There were only 147 families who did not desire guidance, but the majority of these either had no need for controlling conception (*e.g.*, because they were sterile or had been sterilized) or at least believed they needed no such information (*e.g.*, because it was immediately after childbirth or because they thought the wife had already passed childbearing age) as shown in Table 3.

TABLE 2

	Guidance Desired	Guidance Not Desired	Opinion Not Known	Total
Number of Families	264	147	7	418
Per cent	63.1	35.2	1.7	100.0

TABLE 3

Reasons for Not Desiring Guidance	No.	%
Either the husband or the wife is sick, hence no marital relations	71	48.3
No pregnancy has occurred over the past five years or more, so believe no control is necessary	29	19.7
Sterile (involuntarily)	9	6.1
Believe that child-bearing ages have already passed	4	2.7
Pregnant at present	5	3.4
Immediately after childbirth now	7	4.8
Have been sterilized	3	2.0
Have not yet decided to do something for conception control	1	0.7
Want children, no contraceptive measures are needed	18	12.3
Total	147	100.0

However, among those with no interest in conception control, there were 18 families who stated it was because they wanted children. When we examined more closely the families who wanted children, one childless family was found, 8 families with only one, 6 families with 2, and only 3 families with 3 or more children. This kind of finding may appear in any other social group and does not prevent us from saying that the group as a whole was more than normally cooperative. Thus, among those families whom we thought should be practicing conception control, 98.5 per cent actually desired to do so.

Why, then, did they want to control conception so strongly? The following may clarify the situation:

	Per cent
For economic reasons	87.9
For both economic and wife's health reasons	6.8
For reasons related to wife's health	1.9
Other reasons	3.4

Location and number of personal interviews: None of the locations generally used for contraceptive consultation seemed practical for families on public relief. Bringing together a group of people to a certain place, so-called "group work," seemed futile in most cases. The most important problem was how to find an appropriate physical set-up for the guidance program.

We finally discovered a method which proved workable. Use was made of the local welfare agencies where these people on public relief must come once a month without fail. Taking advantage of their attendance at these agencies, we took them to separate rooms and gave necessary instructions about family planning.

No proper equipment or facilities are available for teaching family planning in these agencies, of course. For example, it is hardly possible to give instructions in the use of a vaginal diaphragm. Therefore, the selection of recommended methods was of necessity limited.

Guidance was given rather frequently at first, but as the program progressed teaching was reduced to, say, once every other month. But the educational gap between these infrequent visits of our staff was usually filled by the aid of local case workers.

The personal interviews were conducted in the form of a very confidential talk. We were able to answer any questions raised, but perhaps this could not be expected of general family planning education under present conditions in Japan. However, it should be remembered that whoever is responsible for the personal consultation, the attitude of the teacher is the most important factor. No matter what the question, not a shadow of scorn or blame must be shown. The key to ultimate success in such a consultation is the presence of confidence between the two individuals concerned. Success is solely dependent upon how much sympathy and good will the interviewer shows to these needy families.

Recommended contraceptive methods: Because of the restrictions stated above, recommended methods were limited for the most part to condoms and tablets. The use of sponges or jellies with applicators is not fitting to those who live a simple life. Contraceptives were given free of charge after detailed explanations as to their actual use, and the amount given was sufficient to last until the next interview.

The rhythm method was never recommended except when specifically desired, because we already knew that this method was apt to fail when used among families such as these.

Results of educational work: In the group of 418 families a certain number of families have dropped out of our project because they became ineligible for public relief. At the same time other new families have been added. Thus, the total number of families continuously observed for three years is 277, and the following results refer to these families.

TABLE 4

	Before Guidance	End of First Year	End of Second Year	End of Third Year
Year	Apr. 1952-Apr. 1953	Apr. 1953-Apr. 1954	Apr. 1954-Apr. 1955	Apr. 1955-Apr. 1956
Number of Pregnancies	92	52	48	33
Pregnancy Rate	53.9	27.6	24.5	16.5
Number of Live Births	44	14	16	11
Number of Induced Abortions	45	35	26	22
Number of Miscarriages and Stillbirths	3	3	6	0

Number of pregnancies and pregnancy rate: Table 4 shows the trends in this respect. In the year previous to the initiation of our project, the 277 families recorded 92 pregnancies. In the third year only 33 pregnancies occurred, a decrease to 32 per cent of the number before the project. This reduction in the number of pregnancies means that the contraceptive instruction had fairly great success, we believe.

More exact evaluation of the results, however, calls for the use of the pregnancy rate. We have calculated the rate according to the Stix-Notestein method and found that it decreased from 53.9 for the year previous to the start of our project to 16.5 for the third year of the work, 30.6 per cent of the figure for the year before our work started. This is a remarkable and rapid effect.

Induced abortion: In our experiment emphasis was placed not only upon correct and faithful practice of contraception but also upon the reduction of induced abortions. As a result induced abortions have decreased from 45 to 22 in the course of three years. In a group on public relief even a decrease in induced abortions of this extent can be considered fairly good, because when a woman is protected by public relief an induced abortion can be performed on her without charge by a well-trained doctor in a hospital or dispensary if she so desires. Such an abortion is a part of the medical social services given to anyone who comes under the Daily Life Security Law. Furthermore, the Eugenic Protection Law has a provision that an induced abortion be performed "for economic or physical reasons." The families we have handled are a case in point of this specific provision, and, because of that, we can hardly sweepingly condemn their frequent resort to induced abortion. Considering the circumstances, pretty good results have been obtained in checking their frequent use of induced abortion.

Number of live births: Some pregnancies were terminated by induced abortion for reasons stated above, and some resulted in miscarriages or stillbirths. The remainder constitute the total number of live births observed. If a comparison is made between the births the year previous to our project and the third year, a decrease from 44 to 11, one-fourth, has been recorded. Figures for the birth rate have not been given, because our group does not include wives over 50 years, hence is not comparable with other groups.

Conclusions

Five years have passed since the Cabinet agreed to adopt the dissemination of family planning as a national policy in Japan. Today the extent of its diffusion is said to be nearly 35 per cent, and at the same time the upward trend of induced abortion thus far observed has recently been slowing down gradually. This progress is gratifying, but the next big problem is to ascertain any

uneven or unbalanced dissemination among various groups differing geographically, occupationally, or socio-economically.

Family planning seems to be practiced least successfully in the outlying, less civilized rural areas where most of the villages without doctors are found as well as among those sunk in poverty in the cities.

Our findings from our three-year experiment in teaching family planning and our nation-wide survey are of great value for the successful enforcement of the Government program for disseminating family planning among the extremely poor, we believe. Many interesting and significant points came out, but most important was to discover a suitable teaching approach to people. The problem is not only to find an appropriate place, but a study of "by whom, in what kind of place, and how" in family planning should be discussed. In regard to the question of "where" we took advantage in our experiment of visits to local welfare agencies. However, this approach may not be applicable under the present system of the health and welfare administration in Japan. Conditions must be carefully examined and considerations in relation to the budget weighed before health centers can be used effectively for such purposes. Such a program will almost certainly meet with failure if people are merely ordered to come to certain places for guidance.

In regard to the question of "by whom," it should be well understood that the attitude of the counselors is of great importance, particularly in dealing with families in extreme poverty. A feeling of inferiority is often found among these groups which is very apt to result in lack of cooperation or even in resistance to the program.

In solving the question "how," a way of teaching must be found which fits into actual living conditions. It is especially necessary to teach these families about contraceptives which they can afford to use and which are not rendered impracticable by their housing situations. In our case, we recommended mainly the use of condoms and tablets, but vaginal diaphragms could be used in some instances.

The Japanese Government launched a program for the teaching of family planning in this specific social class last year. Still in its early stages, it may be expected that many difficulties will arise. It is our earnest hope, however, that the Government's efforts will have great success because the program has so much significance both from the standpoint of social policy and racial selection.

Acknowledgments

The author is greatly indebted to the Population Council, Inc. for its valuable assistance to our experiment and survey.

UNIQUENESS OF MAN*

G. W. BEADLE
Division of Biology
California Institute of Technology

Editor's Note:
This address is of exceptional significance because of its description of the task of eugenics: the advancement of human freedom through scientific investigation of population quality and quantity, human heredity, and cultural inheritance.

ALTHOUGH MAN'S HORIZONS of understanding have made it increasingly clear that his own importance as measured in terms of cosmic space and time is vanishingly small, it is still true that on the planet earth his attainments and influence have been matched by no other species. Among the many other respects in which he is unique, he alone is able to investigate his evolutionary past and to speculate intelligently about those aspects of it that he cannot directly explore.

The quest for his own origins has led man to the concept of organic evolution, a concept that is surely one of his greatest intellectual achievements. It is a concept that challenges him to push further and further backward, in his search for understanding, to the very beginning of life on earth—and beyond that to the prelife evolution that must have been before. Short of the origin of the universe, there is no point in the process beyond which his urge to explore no longer extends.

There is as yet no general agreement among cosmologists on how, exactly, the universe is built, or how it began. Some would believe that it began some 5000 to 7000 million years ago as a giant explosion of an enormously dense "primeval nucleus" (1). The present expanding universe is then believed to be a continuation of that explosion. Others prefer to believe that matter is being and always has been created continuously and that the universe is in a steady state of expansion, without beginning and without end (2).

Observational evidence is being accumulated by astrophysicists that may before long answer such questions. Whatever the answers may prove to be, there is increasing reason to believe that the elements have evolved and are now evolving in orderly ways, beginning with hydrogen. The detailed mechanisms by which they thus arise are becoming more and more clearly understood as nuclear physicists and astrophysicists continue their collaborative investigations (3).

Chemical Evolution

At the time the crust of the earth became solid, presumably some 4000 to 5000 million years ago, conditions favored the accumulation of molecules, and these in turn went through an evolutionary sequence as the environment changed. In the early phases of the molecular stage of evolution, only simple molecules were formed. At one period, there were probably present in abundance such gases as hydrogen, ammonia, methane, and water vapor —with perhaps little or no free oxygen (4). Later, more complex molecules, such as amino acids and perhaps simple peptides, were formed (5).

In the more advanced phases of this period, it is believed that there appeared a molecule with two entirely new properties: the ability systematically to direct the formation of copies of itself from an array

*This article is based on the presidential address given to the American Association for the Advancement of Science in New York City on Dec. 27, 1956. Reprinted from *Science*, Jan. 4, 1957 by permisison of *Science* and the author.

of simpler building blocks, and the property of acquiring new chemical configurations without loss of ability to reproduce. These properties, self-duplication and mutation, are characteristic of all living systems and they may therefore be said to provide an objective basis for defining the living state.

Evidence is accumulating that the nucleic acids of present-day organisms possess these two properties (6), and it is perhaps no longer useless to speculate that the first "living" molecule might have been a simple nucleic acid, perhaps protected by an associated simple protein. From such a virus-like system it is possible to conceive how present-day organisms might have evolved. Although the details were surely complicated far beyond the ability of man in his present knowledge to comprehend, it is possible that no principles other than those known to modern biology have to be invoked to explain the entire process.

Through mutation and aggregation of these first "living" molecules, which might be called primitive genes, multimolecular forms that depended for reproduction on preformed building blocks would be expected to arise with the ability to catalyze some of the reactions by which their building blocks were derived from simpler molecules. In a stepwise manner, with each step consisting of a mutation conferring a selective advantage, complete autonomy could be achieved (7). The single-celled green algae represent such an evolutionary stage, with each cell perhaps containing tens to hundreds of thousands of times as much replicating genetic material as did the original ancestral form. This phase of evolution may have lasted 1000 million years or more.

The evolutionary gap between unicellular forms and the most complex multicellular organisms may have been much more easily and rapidly bridged than was that between the unimolecular and unicellular systems. Presumably the early stages in the origin of multicellular plants and animals consisted of simple colonies of like cells. Division of labor among such cells — cellular differentiation, biologists call it—was a logical next step.

In the animal line of descent, differentiation of cells and subsequent evolution of tissue and organ systems made possible the nervous system. It is the extraordinary development of this system in man that sets him apart by such a wide gap from all his contemporary species. It underlies the remarkable development of his intellect, his ability to carry through complex reasoning processes and his highly developed systems of communication.

Cultural Inheritance

The ability to acquire and communicate knowledge has enabled man to supplement biological inheritance with cultural inheritance. No other species has ever developed this type of inheritance to any appreciable extent. The reactions of individuals and groups of the human species to various environmental situations are obviously a result of complex interactions of the two types of inheritance (8).

Although cultural inheritance may have had its first beginnings a half-million years or more ago, it has expressed itself most spectacularly in the last half-dozen millenia. Ancient and modern civilizations with their technologies, arts, music, literatures, sciences, and religions are its products.

Modern technology and science have evolved within a period of a few thousand years. They in turn have made possible the industrilization that has in the past few centuries developed to such a high degree in a few nations of the world.

The recent evolution of cultures, especially in technologic and industrial directions, has created for man an entirely new set of opportunities together with a closely interrelated group of problems. As agriculture provided more food, populations grew. Further technology was catalyzed. Tools evolved, first of stone and wood, then of bronze and copper, and finally of iron and steel. Manpower was supplemented by domestic animals and by machines driven

with the energy of burning wood, coal and oil. At the same time, the art and science of medicine was responsible for spectacular increases in life-expectancies. This helped populations to grow still more rapidly.

All this is an old and well-known story. It is also well known that with urbanization, industrialization, and improved health practices, birth rates tend to fall off, but only after a lag of several generations. This lag is especially marked in those cultures in which for one reason or another education and accompanying industrialization develop very slowly. This is because in general it is easier to introduce drugs and physicians to such cultures than it is to raise markedly their levels of education and technology. Thus, as the demographic transition is made in one culture after another, populations tend to increase sharply and then become stable.

War

For a world with half its nations industrialized and half not, and with its natural resources very unequally distributed, the present population of more than 2500 million is far too large. More than half the people of the world are underfed, are poorly housed, receive little modern medical care, and are inadequately educated. It is small wonder that populations who see so little hope in other directions can be so easily stirred to rebellion and led to war by power-hungry demagogues, charlatans, and other persuasive men of little wisdom.

Overcrowding of hungry people who see little hope for a brighter future is by no means the only cause of war, but it is surely an important one. And without the slightest doubt, war is the most serious of civilization's immediate problems.

Human warfare is as old as man himself. As a part of man's culture, it has evolved from primitive forms of man-to-man combat through the many intermediate stages to its present highly perfected state. During this course, wars have become progressively devastating.

With the development of nuclear weapons, we see a significant discontinuity in this evolutionary sequence. Up to this point wars were largely self-regulating in one way or another, usually through the achievement of victory, hollow though it might have been, by one party. With wars of nuclear weapons, it is entirely conceivable that there will no longer be victors. Participants and onlookers, too, may perish from blast, radiation, and starvation.

This is why a war of nuclear weapons is said to be unthinkable—why there is now "no alternative to peace." Logically it is so. But war never has been logical. In the present state of armament, there can be no guarantee that an illogical lunatic or madman in a position of power will not pull the trigger that will set one off.

Aside from the fact that the present maintenance of peace through mutual threat of annihilation is intolerably dangerous, the pyramiding cost of supporting superior military strength and defenses against potential enemies seriously competes with alternative activities that would decrease the probibility of war. It is no new thought that if the intelligence, imagination, creativity, and drive that now go to maintain military might, not to mention the raw materials and energy devoted to the same purpose, were wisely used for peacetime purposes, the incentives to wage war could be largely abolished.

In spite of the fact that there is wide agreement with the thesis that war is more nearly than ever, synonymous with madness and that decreasing its likelihood is the greatest need of our time, progress is made with discouraging slowness. The obvious solution through mutual disarmament fails because there is no mutual trust among nations.

Food and Population

Although the task of preventing a major war in the immediate future is assigned to the statesmen of the world, with special responsibility in the hands of those of the

more powerful nations, there are many ways in which science can and must contribut toward basic and long-term solutions.

It is difficult for men with empty stomachs to know right from wrong. If the presently available scientific knowledge of agriculture were applied on a world-wide basis, hunger could become unnecessary. But the economic, political, and social problems inherent in doing so are made enormously more difficult by the fact that they must be solved in terms of a world divided into many nations. Solutions are possible, and every possible effort should be devoted to attempts now being made to arrive at them.

In the time required to increase food production sufficiently to feed more than 2500 million people adequately, there will, unfortunately, be many more than that to feed. With the present excess of births over deaths, the world's population is annually increasing by 30 to 40 million. Food production must therefore more than catch up with present needs. This will require that efforts be stepped up by even larger factors. More land must be brought under cultivation, and yields must be increased. This means more fertilizer, more water for irrigation—perhaps through recovery from sea water—and more plant and animal breeding. The food of the oceans will have to be harvested in increasing amounts, and the practicability of entirely new methods of agriculture, such as those of algal farms, will have to be explored.

All this will require more technology and a great extension and evolution of industry. Consumption of raw materials and energy will rise markedly. The general level of education will have to be raised on a world-wide basis. Better use of manpower resources, especially at the intellectual level, will be increasingly necessary.

If the peoples of the world can somehow be induced to work together, there is no apparent reason why all of this cannot be done (9). While it is being done, what will be the trend of population growth? With the spread of technology and education, will birth rates in fact fall off until populations reach approximate equilibrium in size? It is a widespread belief that they will. The decreased birth rates that accompany education are attributed to an increased desire to limit family size plus greater knowledge of birth control techniques. If so, education and the discovery and development of improved methods of birth control may in time largely solve the quantitative problem of population growth.

However, the hope that prosperity and education will continue automatically to lead to population stabilization through voluntary birth control has been considerably dimmed by the marked postwar increases in birth rates in the United States and other industrialized nations. Indeed this phenomenon raises the question of whether Malthus was not fundamentally right (10-12), in spite of his many detractors of recent times.

Whether or not the present high birth rates in industrialized nations are temporary and will in the long run be smoothed out at a lower level, the whole question of the adequacy of voluntary family limitation in regulating the growth of populations will have to be faced sooner or later. This is because the problem of control may not be a wholly quantitative one. Because it will inevitably be uneven in its application, voluntary and individual family control is bound to lead to changes in population composition. Differences in net reproductive rates may depend on such factors as genetic background, cultural history, and economic status. Whatever their cause, they may well produce population changes of the greatest significance to man's future. For example, it has many times been pointed out that under a system of voluntary birth control the less fit intellectually may be lacking in social responsibility and might therefore have a

higher than average net reproductive rate. If differences in intelligence of this kind have an important genetic component, there is a theoretical possibility that progressive intellectual disintegration could become an important factor in shaping the nature of future populations.

Alternatives to population control through voluntary decisions on the part of individuals—society-imposed family quota schemes, to mention one conceivable possibility—raise religious, moral, and ethical questions of such magnitude that no responsible society has ever given them serious consideration except under the most unusual and special circumstances. It could well be that societies may eventually be forced to face this unpleasant problem more realistically than they so far have (11, 12).

At the same time that solutions are being sought to problems of population growth, food production, raw material supplies, energy resources, and the training of manpower, effective ways must be found to abolish the threat of war that has so long and so constantly plagued man. All responsible statesmen know this, and they have pointed out repeatedly that the one formula most likely to succeed is the development of a union of nations in which authority and power are commensurate with responsibility (13). There appears to be no other way to protect individual nations against those unwise and irresponsible acts of other nations that are the precursors of violence. It is, of course, now a common hope of many nations and many individuals that the United Nations will evolve into just such a union. If it is to do so, the hope must spread widely and grow to the intensity of a demand.

There is no reason why individual nations under such a union cannot continue to approach their internal problems in a variety of ways and with the hope that ultimately the wide gaps that now exist among nations of differing political, social, and economic ideologies will be closed through convergent social evolution.

Cultural and Biological Self-Direction

Man's evolutionary future, biologically and culturally, is unlimited. But far more important, it lies within his own power to determine its direction. This is a challenge and an opportunity never before presented to any species on earth.

It has been clear for a long time that man is potentially capable of cultural self-direction—that he could, to a much greater extent than he now does, consciously select his cultural objectives. What is not so obvious is that it has now become possible to exercise a comparable degree of control over his purely biological evolution.

Through the understanding of heredity that man has gained within the past half-century, he has acquired the power to direct the evolutionary futures of the animals he domesticates and the plants he cultivates. At the same time and in the same way, he has won the knowledge that makes it possible deliberately to determine the course of his own bioligical evolution. He is in a position to transcend the limitations of the natural selection that have for so long set his course (8).

But knowledge alone is not sufficient. To carry the human species on to a future of biological and cultural freedom knowledge must be accompanied by collective wisdom and courage of an order not yet demonstrated by any society of men. And beyond knowledge, wisdom, and courage, faith, too, will be essential. Man must have faith in himself. He must have faith in the rightness and goodness of his goals. And many would add that he must continue to have spiritual faith.

Faith, belief, and the urge to go on and on have themselves come out of man's past as a part of the evolutionary pattern that has fashioned him into the unique being he is. In his uniqueness, he is capable of attaining heights far greater than his most magnificent cultural achiements of the past.

REFERENCES

1. G. Gamow, *Sci. American* **195,** No. 3, 136 (1956).
2. F. Hoyle, *ibid.* **195,** No. 3, 157 (1956).
3. W. A. Fowler, *ibid.* **195,** No. 3, 82 (1956).
4. H. C. Urey, *Proc. Natl. Acad. Sci. U.S.* **38,** 351 (1953).
5. S. L. Miller, *Science* **117,** 528 (1953).
6. J. D. Watson and F. H. C. Crick, *Cold Spring Harbor Symposia Quant. Biol.* **18,** 123 (1953).
7. N. H. Horowitz, *Proc. Natl. Acad. Sci.* **31,** 153 (1945).
8. T. Dobzhansky, *The Biological Basis of Human Freedom* (Columbia Univ. Press, New York, 1956).
10. R. C. Cook, *Human Fertility: The Modern Dilemma* (Sloane, New York, 1951).
11. C. G. Darwin, *The Next Million Years* (Hart-Davis, London, 1952).
12. K. Sax, *Standing Room Only* (Beacon, Boston, 1955).
13. Q. Wright, *A Study of War* (Univ. of Chicago Press, Chicago, 1942).

SOME RELATIONS BETWEEN THYROID DISEASE AND GENETICS*

SIDNEY C. WERNER
Department of Medicine
Columbia University College of Physicians and Surgeons
and the Presbyterian Hospital in the City of New York

THE ROLE OF GENE-SPECIFIC ELEMENTS in thyroid disease has been subjected to critical analysis by many geneticists. There is still lack of uniformity of opinion about some aspects of the problem (1,2a), despite general agreement that genetic factors seem to be involved. Disagreement exists as to whether one or two genes may be involved, and as to whether such genes are recessive or dominant, of high or of low penetrance.

It is not the purpose of the present paper to pursue this analysis further. Progress must come from further study by experts in this field. Rather, this presentation has been designed to summarize those aspects of thyroid disease and physiology which may bear upon the making of such an analysis, or which may otherwise be of interest to the geneticist.

Classification of Thyroid Disease

Thyroid disease is generally divided functionally, according to whether the patient is euthyroid, hyperthyroid, or hypothyroid (3). These categories are then subdivided on a pathological basis. The euthyroid group comprises those patients with nontoxic diffuse goiter, nontoxic nodular goiter, thyroid cancer, and most instances of thyroiditis. Nontoxic goiter may be further classified into endemic or sporadic, congenital or juvenile subgroups. Hyperthyroidism is represented by 2 pathological entities, toxic diffuse goiter and toxic nodular goiter. The hypothyroid group is categorized in many ways, according to etiology, pathology, age of onset, or a mixture of these when feasible.

Question of a Unified Schema for Thyroid Disease

A question of pertinence to the geneticist is whether thyroid disease includes a number of discrete disorders or represents only the varied manifestations of a single disorder. This latter possibility is sometimes expressed by the slogan that "hyperplasia leads to neoplasia." According to such a schema:

It is well known, for example, that endemic goiter, due presumably to iodine want, begins as a diffuse process. There follows the cycle of hyperplasia and involution described by Marine (4) ending ultimately in nodular goiter. If iodine is made available, there may be sudden onset of

*Some of the work from this laboratory cited in the paper was aided by grants A-8 (C7) and A-1233, Division of Arthritis and Metabolism, National Institutes of Health.

[1]Whether toxic diffuse goiter arises from antecedent nontoxic diffuse goiter in non-endemic are: or whether the disorder is toxic from inception is an open question; probably the latter view is correct. It is also unsettled whether toxic nodular goiter is primarily toxic diffuse goiter with incidental nontoxic nodularity, as seems to be the case from radioautographic studies, or is a separate entity as seems to be the case from clinical behavior (3).

hyperthyroidism, the "Jod Basedow" of the German school (5).

Experimentally, the sequence has been studied further. Mice have been given antithyroid drugs chronically. They develop initially a diffuse hyperplasia of the thyroid and then nodularity of the gland (6). Morris transplanted such nodules into other mice maintained on antithyroid drug. After several generations, he found that the transplants became autonomous and truly neoplastic. This suggests that persistent hyperplasia had indeed led to neoplasia. Cancer has also been produced in the thyroid of rats given propylthiouracil therapy for several years (7). The block to hormonal synthesis by the gland causes a decrease in circulating thyroid hormone, compensatory hypersecretion of pituitary thyrotropin, and as a result, protracted stimulation of the thyroid.

Somewhat similar observations have been made in the young of maternal mice given I-131 near term (8). The isotope crosses the placenta and is taken up by the fetal thyroid which in turn becomes injured by radiation effect. As the young become adults, nontoxic nodules, benign thyroid adenomas and pre-cancerous Hurthle cell infiltration of the thyroid appear, presumably from continued thyrotropic stimulation. In congenital goiter in man, the seemingly large diffuse gland is almost invariably found on pathological examination to contain nodules, frequently adenomas, and occasionally papillary change (9).

Thus, the experimental data fit with a unified schema for thyroid disease, at least of the nontoxic variety. On the other hand, clinical studies lead to the viewpoint that thyroid cancer is cancer from its inception and not a development of diffuse or nodular goiter (10).

Some Clinical Pitfalls in the Pedigree Method

Apart from the obvious meaning to the geneticist of the studies just presented, there is another lesson involved. Pedigrees in nontoxic thyroid disorders are subject to great errors unless the disease of the index case and his relatives was established by operation and pathological examination of the tissue obtained. Clinical diagnoses or hearsay evidence may be inaccurate and misleading.

Also open to question is information about the functional status of the gland in thyroid disease, namely, whether the goiter is toxic or nontoxic. Apart from the inherent difficulties in diagnosis, the life history of thyroid disease becomes important in this regard. Nontoxic goiter may later become toxic, and toxic goiter may subside spontaneously to reactivate after a time, or to enter sustained spontaneous remission. Both circumstances may lead to errors in the pedigree.

At the present time, some of the newer test procedures make possible a more accurate diagnosis of the functional status of the thyroid than was possible in earlier studies. The use of radioiodine in uptake and labelled hormonal release procedures, as well as the chemical determination of the level of serum precipitable (protein bound) iodine have greatly increased diagnostic efficiency. Still more specific for hyperthyroidism has been the triiodothyronine suppression test (11). This latter derives from experimental studies which revealed that the normal pituitary thyroid relation is disrupted in hyperthyroidism, (12). Thus, an excess of thyroid hormone administered to healthy subjects suppresses release of thyrotropin by the pituitary. As a consequence, activity of the thyroid decreases, with a sharp drop in I-131 uptake. In hyperthyroid patients, however, no suppression of uptake results even when doses are given which are sufficient to produce drastic symptoms of thyrotoxicosis (13).

In hyperthyroidism in remission, either spontaneously or after definitive therapy, the abnormal response to triiodothyronine administration may persist for some years, although the response reverts to normal in

the majority after 5 years of euthyroidism (10). It is of interest in this connection that Ingbar and associates failed to demonstrate an abhormal response to triiodothyronine in the relatives of patients with hyperthyroidism (15). On the other hand, they found that the carrier proteins for thyroxine had a decreased binding capacity in both the patients and their euthyroid relatives.

Triiodothyronine fails to suppress I-131 uptake in 1 of 4 patients with nontoxic nodular goiter. Such patients could well be in a pre-hyperthyroid phase, since the life history of the "hot" nodule suggests that hypersecretion is its ultimate goal (16). It is of interest in this connection that Martin and Fisher could obtain no incontrovertible evidence of the action of a recessive gene in toxic nodular goiter although they found such for toxic diffuse goiter (17).

Most genetic studies of toxic goiter reveal that some of the relatives of the index case are said to have nontoxic goiter and some hypothyroidism. It is important to stress that the inherent errors in the diagnosis of hyperthyroidism apply perhaps even more strongly to hypothyroidism. Such diagnoses in the past, short of frank myxedema, must be regarded with caution.

It is thus clear that pedigree data from the past and the conclusions drawn therefrom may not be satisfactory. Perhaps a current-day reappraisal of the problem is in order, employing series of patients scrupulously screened by modern techniques.

Enzymatic Defects in Cretinism and Congenital Goiter

The mechanisms responsible for the production of cretinism and congenital goiter are slowly being elaborated. The suggestion recently made by several groups (18-20) seems to be increasingly confirmed that enzymatic defects might be responsible for at least some of these disorders. This possibility was expressed earlier by Gates in his text (1).

The synthesis of thyroid hormone can be outlined as a series of steps: accumulation and trapping of iodide ion; oxidation of the ion to a form which reacts with tyrosine to form mono- and diiodotyrosine; and finally coupling of diiodotyrosine to yield thyroxine. Iodination is thought to occur in the aminoacids of already formed protein rather than in free amino acids which are later combined into protein. Deiodination of these compounds also occurs: at the thyroxine level to form triiodothyronine, and at the diiodotyrosine level to form monoiodotyrosine and iodide ion. However, an enzyme for deiodination of thyroxine has not been found in the thyroid itself but only peripherally, whereas mono- and diiodotyrosine are deiodinated both in the gland and peripherally.

At present patients with cretinism and congenital goiter have been identified with defects in trapping of iodide, in dehalogenation of mono- and diiodotyrosines, and in coupling of diiodotyrosine. These defects are presumably due to absence of the enzymes responsible for these processes. Familial accumulation is observed in the histories of some of these patients, and in these a gene-controlled basis for the errors of metabolism is implied (21).

In 1950, Stanbury and Hedge encountered a goitrous cretin with an unusually high uptake of I-131 by the gland (22). However, the trapped iodine failed to leave the gland. The iodine was proven to be trapped but not bound because it was discharged by the gland upon the administration of thiocyanate ion. Stanbury tested the 3 siblings of this member of the family and found the same defect in all.

In 1953, McGirr and Hutchison (18) and Hubble (20) demonstrated a rapid turnover of I-131 in patients with goiter and cretinism. They were at that time unable to identify the compounds secreted, although they lately have reported the presence of mono- and diiodotyrosine in the serum of one of their patients (23); or the abnormal mechanism responsible for their

release. More recently, Stanbury and group studied a family of Dutch adults and demonstrated that mono- and diiodotyrosine were present in their sera (24). Some of these were goitrous cretins, some simply goitrous. By using I-131 labelled diiodotyrosine, these workers were able to demonstrate that very limited deiodination of this material took place, either peripherally as occurred readily in normal subjects, or in the thyroid (25). Thus at least a partial explanation of the mechanism responsible for the disorder in this group appears to be limited dehalogenase activity within the thyroid and peripherally.

While this work was going on, a 5-year-old mildly hypothyroid colored girl with a large vascular goiter, and a family history of goiter in a cousin, was seen in our clinic (9). The serum was found to contain both mono- and diiodotyrosine. Active dehalogenation of diiodotyrosine was readily demonstrable in gland and periphery. Following a labeling dose of I-131, the thyroid was found to contain mostly labeled mono- and diiodotyrosine and very little thyroxine. These findings suggested that a defect in the coupling of diiodotyrosine was present, possibly due to an enzymatic failure. Thus thyroxine could not be formed, and the excess of diiodotyrosine was discharged into the circulation. Stanbury and group on indirect evidence made a similar surmise in another patient (26).

Recently a cretin with markedly delayed growth and a cretinoid adult with failure of sexual maturation have been shown in our laboratory to have circulating iodoproteins as the defect (27). No definite family history was obtainable to establish the abnormality in other members of the family.

Genetic Implications of I-131 Therapy for Thyroid Disease

Hyperthyroidism and thyroid cancer are successfully treated by I-131. This isotope emits both beta and gamma rays which provide radiation effect. Since the isotope is largely accumulated by the thyroid, most of this effect is limited to the gland. However, a certain amount of general body radiation results, as well as specific organ radiation, such as to the gonads.

Glass has estimated the effect of radiation from I-131 therapy upon the mutation rate in the offspring of the population as a whole, and in the progeny of the particular patient (28). From a liberal estimate of the number of patients of childbearing age who might be treated annually and from the dosages in current use, he has estimated that the increase in mutations from this cause will have virtually no meaning for the population at large. To quote him:

> "The average gonadal dose can be estimated to be about 6 rads per person from data presented at the recent A. E. C. sponsored conference on I-131 therapy. This indicates an equivalence of about 1 rad to the gonads from 1 millicurie of radioiodine administered. The effect upon the population as a whole must be regarded as negligible because of the small number of individuals being treated. Thus one can assume that 100,000 persons under 40 years of age are given radioiodine in the course of a human generation, a number which is much greater than actually now given such treatment. The product would be 1500 mutations scattered in the descendants of these 100,000 persons in a population of 100 million persons per generation. The permissible dose set by the National Academy of Science Committee, 10 r, administered to the entire population would result in 5 million mutations. The ratio works out 0.03 per cent or 3/10,000 of what might be considered a critical limit. Even if 100,000 persons were treated per year, this would produce only 45,000 mutations, which works out at 0.9 per cent of the permissible limit. Since the administration of radioiodine is only one of many sources of radiation exposure to which the population is subject, I would think personally that this latter level would begin to be of some significance.
>
> If the administered dose averaged 36 rads, this would about equal the dose that would double the spontaneous mu-

tation rate from all sources, including the background radiation."

However the situation for the individual patient is somewhat different. As just seen from Dr. Glass' estimates, the possibility of tangible genetic defects in the progeny of the I-131 treated individual is about 1 to 2 per cent (1500 mutations per 100,000 patients at risk) with the usual doses employed in the treatment of hyperthyroidism, about 10 per cent of which would appear in the first generation. Such a likelihood may be small percentage-wise. Yet it would seem to be too large to warrant I-131 therapy in the younger age groups when only uncomplicated hyperthyroidism is being treated, and not cancer. Here surgery is available, is effective, and carries no such genetic risks.

SUMMARY

1. An analysis has been made of some of the facets of thyroid disease which bear upon the field of genetics. It has been concluded that inaccuracies in clinical diagnosis may have affected the value of many of the pedigree studies of the past in this field. A reappraisal of the subject in series of patients screened with modern techniques may be in order.
2. Certain enzymic failures in cretinism and congenital goiter have been recently demonstrated and suggest the possibility of a gene-controlled basis for these defects.
3. The use of I-131 therapeutically in hyperthyroidism is gradually being extended to patients of childbearing age. The genetic implications are discussed, and it is concluded on these grounds that I-131 treatment in this age group is probably unjustifiable.

REFERENCES

1. Gates, J., 1946. *Human Genetics.* Vol. I. Macmillan Co., New York.

2a. Sorsby, A., 1953. *Clinical Genetics.* Butterworth, London.

2. Kemp, T., 1951. *Genetics and Disease.* Ejnar Munksgaard, Copenhagen.

3. Werner, S. C., Editor, 1955. *The Thyroid: A Fundamental and Clinical Text.* Paul B. Hoeber, New York.

4. Frantz, V. K., & Werner, S. C., 1955. *The Thyroid: A Fundamental and Clinical Text.* Paul B. Hoeber, New York. p. 278.

5. Means, J. H., 1948. *The Thyroid and its Diseases.* J. B. Lippincott Co., Philadelphia.

6. Morris, H. P., & Green, C. D., 1951. The role of thiouracil in the induction, growth and transplantability of mouse thyroid tumors. *Science* **114**: 44.

7. Purves, H. D., & Griesbach, W. E., 1947. Studies on experimental goiter; thyroid carcinoma in rats treated with thiourea. *Brit. J. Exp. Path.* **28**:46.

8. Speert, H., Quimby, E. H., & Werner, S. C., 1951. Radioiodine uptake by the fetal mouse thyroid and resultant effects in later life. *Surgery, Gynecol. & Obstet.* **93**:230.

9. Werner, S. C., Block, R. J., Mandl, R. H., & Kassenaar, A. A. H. Pathogenesis of a case of congenital goiter with abnormally high SPI levels and with mono- and diiodotyrosine in the serum. *J. Clin. Endoc. & Metab.* In Press.

10. Sloan, L. W., & Frantz, V. K., 1955. Werner, S. C.: *The Thyroid: A Fundamental and Clinical Text.* Paul B. Hoeber, New York. Ch 24, P. 394.

11. Werner, S. C., 1955. A new and simple test for hyperthyroidism employing 1-triiodothyronine and the 24 hour I-131 uptake method. *Bull. N. Y. Acad. Med.* **31**: 137.

12. Werner, S. C., Spooner, M., & Hamilton, H., 1955. Further evidence that Graves' disease is hyperthyroidism and not hyperpituitarism: effects of triiodothyronine and sodium iodide. *J. Clin. Endoc.* **15**: 715.

13. Werner, S. C. & Hamilton, H., 1953. Pituitary-thyroid relations. Lancet **1**: 796.

14. Werner, S. C., 1956. Response to triiodothyronine as index of persistence of disease in the thyroid remnant of patients in remission from hyperthyroidism. *J. Clin. Invest.* **35**: 57.

15. Ingbar, S. H., Freinkel, N., Dowling, J. T., & Kumagai, L. F., 1956. Abnormalities of iodine metabolism in euthyroid relatives of patients with Graves' disease. *J. Clin. Invest.* **35**: 714.

16. Means, J. H., 1954. *Lectures on the Thyroid.* Harvard University Press, Cambridge.

17. Martin, L. & Fisher, R. A., 1945. The hereditary and familial aspects of exophthalmic goitre. *Quart. J. Med.* **38**: 207.

18. McGirr, E. M. & Hutchinson, J. H., 1953. Sporadic cretinism with goiter. *Lancet* **1**: 1117.

19. Wilkins, L., Clayton, G. W. & Berthrong, M., 1954. Development of goiters in cretins without iodine deficiency: hypothyroidism due to apparent inability of the thyroid gland to synthesize hormone. *Pediatrics* **13**: 235.

20. Hubble, D., 1953. Familial cretinism. *Lancet* **1**: 1112.

21. Stanbury, J. B. & Querido, A., 1956. Genetic and environmental factors in cretinism: a classification. *J. Clin. Endoc. & Metab.* **16**: 1522.

22. Stanbury, J. B., & Hedge, A. N., 1950. A study of a family of goitrous cretins. *J. Clin. Endoc.* **10**: 1471.

23. McGirr, E. M. & Hutchinson, J. H., 1956. Sporadic cretinism with goiter. *Lancet* **1**: 106.

24. Stanbury, J. B., Kassenaar, A. A. H. & Meijer, J. W. A., 1956. The metabolism of iodotyrosines. II. The metabolism of mono- and diiodotyrosine in certain patients with familial goiter. *J. Clin. Endoc. & Metab.* **16:** 848.
25. Querido, A., Stanbury, J. B., Kassenaar, A. A. H. & Meijer, J. W. A., 1956. The metabolism of iodotyrosines. III. Diiodotyrosine deshalogenating activity of human thyroid tissue. *J. Clin. Endoc. & Metab.* **16:** 1096.
26. Stanbury, J. B., Ohela, K. & Pitt-Rivers, R., 1955. The metabolism of iodine in 2 goitrous cretins compared with that in 2 patients rereceiving methimazole. *J. Clin. Endoc. & Metab.* **15:** 54.
27. Werner, S. C., Block, R. J. & Mansl, R. H. Circulating iodoproteins in a non-goitrous adult with primary amenorrhea, bony deformities, normal SPI and I-131 uptake. Submitted for publication.
28. Glass, J. B., Nov. 9, 1956. A.E.C. sponsored conference, 10 years of I-131 therapy. Argonne Hospital and Univ. of Chicago.

CONSANGUINEOUS MARRIAGES IN ITALY

A Note

MARCO FRACCARO
The State Institute for Human Genetics
Uppsala, Sweden

ITALIAN OFFICIAL STATISTICS PROVIDE information on the frequency of first cousin marriage (without specification of different mating types) and of uncle-niece and aunt-nephew marriage. Figures are given for different regions according to an administrative subdivision. It may be of some interest to explore what kind of information can be extracted from such data and point out at the same time their existence to students interested in human population genetics.

Table 1 gives the frequency of uncle-niece, aunt-nephew and first cousin marriages contracted in 1953 in the 19 administrative regions in which the Italian territory is divided. Figure 1 shows the localization of the regions. The mean coefficient of inbreeding (α) has been calculated from the three types of marriages and for each region and is given in Table 2. For a discussion of the genetic implications of the mean coefficient of inbreeding see Haldane & Moshinsky (1939).

Isolate size as defined by Dahlberg (1929) has been calculated from the data on first cousin marriages and of marriages to parents' sibs for each region, and is also given in Table 2.

The formulae are:

$$n = \frac{2b\ (b\text{-}1)}{c}$$ for first cousin marriages,

and,

$$n = \frac{4b\ (b\text{-}1)}{(2+b)\ c}$$ for uncle-niece and aunt-nephew marriages,

where b is the average number of marrying children per family and c is the incidence of the type of consanguineous marriage

TABLE 1

INCIDENCE OF UNCLE-NIECE, AUNT-NEPHEW AND FIRST COUSIN MARRIAGES CONTRACTED IN ITALY, 1953.

Region	No. of Marriages	Consanguineous Marriages			
		Uncle-niece	Aunt-nephew	First Cousin	
				No.	Per cent
Piemonte	23,097	12	3	46	0.20
Valle d'Aosta	655	2	—	1	0.15
Lombardia	44,678	34	2	111	0.25
Trentino-Alto Adige	4,723	2	—	13	0.28
Veneto	29,374	20	—	34	0.12
Friuli-Venezia Giulia	6,181	6	—	5	0.081
Liguria	9,697	3	—	8	0.082
Emilia-Romagna	25,987	12	1	20	0.077
Toscana	21,971	22	—	34	0.15
Umbria	6,637	6	—	8	0.12
Marche	10,810	5	—	7	0.065
Lazio	24,765	17	1	49	0.20
Abruzzi e Molise	13,338	15	—	78	0.58
Campania	35,331	24	2	192	0.54
Puglia	22,211	20	—	133	0.60
Basilicata	4,789	2	—	34	0.71
Calabria	15,301	19	2	161	1.05
Sicilia	33,180	59	19	549	1.65
Sardegna	7,968	7	1	58	0.73
Total	340,695	287	51	1,541	0.45

TABLE 2

ESTIMATES OF MEAN COEFFICIENT OF INBREEDING (a) AND ISOLATE SIZE FROM THE DATA OF TABLE 1

Region	Mean Coefficient of Inbreeding $a \times 10^{-4}$	Isolate Size Estimated From	
		First Cousin Marriages	Uncle-niece aunt-nephew Marriages
Piemonte	2.06	2,010	3,080
Valle d'Aosta	4.78	2,670	645
Lombardia	2.56	1,610	2,480
Trentino-Alto Adige	2.25	1,430	950
Veneto	1.57	3,330	2,960
Friuli-Venezia Giulia	1.72	4,940	2,060
Liguria	0.90	4,880	6,450
Emilia-Romagna	1.11	5,200	4,000
Toscana	2.22	2,670	2,000
Umbria	1.88	3,330	2,220
Marche	0.98	6,150	4,700
Lazio	2.15	2,000	2,860
Abruzzi e Molise	5.06	690	1,820
Campania	4.32	740	2,670
Puglia	4.87	670	2,220
Basilicata	4.96	560	5,000
Calabria	8.29	380	1,430
Sicilia	13.28	240	850
Sardegna	5.80	550	4,000
Total	3.99	880	2,150

Fig. 1—Incidence of first cousin marriages in the Italian regions. Per cent of the total number of marriages contracted in 1953.

taken into account. I take $b = 2$, but this is a conservative figure for most Italian regions, since it would imply a stationary population.

Recently Morton (1955)* showed that non-randomness in consanguineous marriage affects to a great extent the estimates of isolate size based on different types of consanguineous marriage. Non-randomness is evident in the case of marriages to parents' sibs, where those between uncle and niece are much more frequent than those between aunt and nephew.

Morton, using data from Austria and from Japan, showed that non-randomness is significant among different mating types of first cousin marriages and persists in the different mating types of first cousin once removed, second cousin once removed, and second cousins. Non-randomness in first cousin marriage is also evident in a series assembled by Shields and Slater (1956).

The present data confirm the discrepancy between the two mating types uncle-niece and aunt-nephew. Uncle-niece marriages in 1953 in Italy are approximately 10 times more frequent than aunt-nephew

marriages, 287:31.

The incidence of these marriages is higher in Italy (0.09 per cent) when compared with the frequencies observed in Austria and in Brazil (Freire-Maia, 1952), which are both about 0.05 per cent. The difference between the Italian and the Austrian data (as quoted by Morton) is significant: 318 in 340,693 marriages in Italy, 63 in 117,431 marriages in Austria ($\chi^2 = 16.15$ for 1 D.F.).

The prevailing notion of permissible marriages and other social factors clearly determine these frequencies. In Sweden, for instance, marriages to parents' sibs were illegal until 1937 (*cf.* Larson, 1956).

In some of the Italian regions the incidence of marriages to parents' sibs is very close to that of first cousin marriages (*cf.* Veneto, Marche, Umbria, Toscana) and in some instances even higher (*cf.* Valle d'Aosta, Friuli-Venezia Giulia). In these cases the "isolate size" is of course smaller when measured by the incidence of marriages to parents' sibs than by the incidence of first cousin marriages.

An analysis of the incidence of first cousin marriages by region does not have much meaning, since the "region," as defined by an administrative point of view, has wide geographical and social differences. Lombardy, for example, is inclusive of several large towns and of remote alpine valleys.

The highest incidences of first cousin marriages are observed in Calabria (1.05 per cent) and Sicily (1.65 per cent). The mean coefficient of inbreeding for these two regions is 0.0008 and 0.0013, respectively. Marriages to parents' sibs contribute 21 per cent and 22 per cent, respectively, of these two estimates. The isolate size is 380 and 1430 in Calabria and 240 and 850 in Sicily, according to the two different estimates given in Table 2. The number of potential mates for each individual should be therefore roughly between 200 and 700 in Calabria and 120 and 420 in Sicily.

These are purely numerical exercises and the reader interested can compare the estimates of isolate size in Table 2 with the estimates given for other populations (by Morton, Table 2, p. 18). The value of b can be substituted in the formulae obtaining estimates of a different magnitude.

The concept of isolate size as introduced by Dahlberg in 1929 remains useful as a first, rough approach to these problems. Effective population size and isolation by distance in the sense of Wright are a further step (see Li, 1955, for discussion). How far observations fit the theoretical models is an important problem. The collection of actual data by field work in relatively definite regions is expensive in time and labor but rewarding (Böök, 1956, Cavalli Sforza, 1956).

A final but decisive point is the reliability of the data discussed in this note. Extreme caution should be taken in their use. Serra (1956) has been able to show in preliminary research on the incidence of consanguineous marriages in the Diocesis of Milano that the figure given for first cousin marriages in Lombardy in Table 1 is probably an underestimate. This author found in the parish books of the Diocesis of Milano 102 first cousin marriages contracted in 1953 out of a total of about 20,000 marriages.

We must conclude that the data on consanguineous marriage gathered in the Italian official statistics are not suitable in their present form for an efficient analysis of the breeding patterns of human populations and of their genetic implications. It is, however, useful to have such data at hand.

REFERENCES

Annuario di Statistiche Demografiche, 1953. Istituto Centrale di Statistica, Roma, 1955.

Böök, J. A., 1956. Genetical investigations in a North-Swedish population. Population structure, spastic oligophrenia, deaf mutism. *Ann. Hum. Genet.*, **20**: 239-250.

Cavalli Sforza, L. L., 1956. Some notes on the breeding patterns of human populations *I int. Congress Human Genetics. Book of abstracts*, p. 80. Copenhagen.

DAHLBERG, G., 1929. Inbreeding in man. *Genetics*. **14**: 421-454.

FREIRE-MAIA, N., 1952. Frequencies of consanguineous marriages in Brazilian populations. *Amer. J. Hum. Genet.* **4**: 194-203.

HALDANE, J. B. S. AND MOSHINSKY, P., 1939. Inbreeding in Mendelian populations with special reference to human cousin marriage. *Ann. Eugen.*, **9**: 321-340.

LARSON, C. A., 1956. Genetic-hygienic impairment through incestuous matings. *Eugen. Quart.* **3**: 104-106.

LI, C. C., 1955. *Population Genetics*. Chicago: The University Press.

MORTON, N. E., 1955. Non-randomness in consanguineous marriage. *Ann. Hum. Genet.*, **20**: 116-124.

SERRA, A., 1956. Personal communication.

SHIELDS, J. AND SLATER, E., 1956. An investigation into the children of cousins. *Acta Genet.* **6**: 60-79.

BOOK REVIEWS

OVERPOPULATION AND FAMILY PLANNING: REPORT OF THE PROCEEDINGS OF THE FIFTH INTERNATIONAL CONFERENCE ON PLANNED PARENTHOOD, October 24-29, 1955. Tokyo, Japan. Editor, Dr. L. N. Jackson. English and Japanese editions published by the International Planned Parenthood Federation, 69 Eccleston Square, London, S. W. I., England. Price: Sterling £1.1s.; Indian Rs. 7/-; U.S. $3.00.

Appropriately bound in warning red, this packed volume of some seventy-five papers by experts from several countries offers factual analysis, predictions and possible solutions for what is increasingly called the world's most pressing problem—a too rapid growth in many areas of population in relation to resources.

As the Japanese papers clearly reveal, the Japanese Government and growing numbers of the people are fully aware of this peril in Japan. Since the close of World War II, they have become alerted and alarmed by the jump in population to 89.3 million (1955), a number annually increased by more than a million new mouths to feed. With a population density of 242 per square km., the Japanese are squeezed into an area roughly the size of California. Where can they go? No *Lebensraum* now for expansion! As for emigration, quite aside from the obstacles to it, this form of relief has never been popular—during a period of thirty years, the peak figure of 1939 enumerated only 23,000. Yet what work can they find at home? Foreign markets were lost by the war and more than 95 per cent of the arable land is already devoted to food production. Even so, 25 per cent of the food must still be imported as must many other necessities. In 1956, statistics disclosed that 750,000 Japanese were without employment and five million partially so. Professor Koichi Aki of Tokyo University had previously told the conference that "to create employment for an additional million, year in and year out, is immediately imperative."

How ironical that after the disaster of war, Japan should find in what should be the greatest blessing—death control—only another disaster and one likely to last much longer! As was constantly repeated at the conference, death control offered by modern medicine, unless balanced by concomitant birth control, must defeat its beneficent ends in overpopulated countries with insufficient means to support the existing inhabitants.

Once aware of this latest threat to national existence, the immediate question in Japan arose—what could be done to offset it? In desperation, the Government turned to abortion, a remedy already resorted to by many women, though in secrecy. The Eugenic Protection Law of 1948 was revised to legalize any abortion performed by a physician—to be sure, for eugenic, medical or economic reasons—but at his full discretion. Now the practice spread throughout the country like smallpox before vaccination. The birth rate has declined markedly, dropping from 34.3 per thousand in 1947 to 20 per thousand in 1954. But likewise in 1954, the death rate, which was 11.9 in 1948, dropped to 8.2 per thousand. The Health and Welfare Ministry estimated that in 1955 the number of abortions—more than 2 million—exceeded births.

The effect of easy abortion on Japanese mothers' health was so deleterious that, stimulated by Dr. Yoshio Koya, Public Health Director, the Government determined in October 1951 to attempt to replace abortion by conception control. One result was the invitation in 1954 to the International Planned Parenthood Federation by the Family Planning Federation of Japan to hold its fifth conference in Tokyo in October, 1955. More than 500 delegates

and observers attended, nearly 100 from 20 countries other than Japan. The preceding spring, Margaret Sanger addressed the Japanese Diet on population control—the first foreign woman to be so invited. As Dr. C. P. Blacker (Britain) pointed out in his paper, "A demographic argument for birth control which, though recognized, has never carried much weight in Western countries, was suddenly brought into central prominence."

Although a section on demography was, of course, included in the conference, the Japanese had requested that most of the time be reserved for papers and discussion on contraceptive research and methods. This was done and more than a dozen top-level scientists in the field of human reproduction from seven countries were assembled in Tokyo. To the reader of the Proceedings their names will be familiar among many others who made their findings available to the conference. Seven chapters deal with papers on aspects of family planning relating to sociology and health, to eugenics, to methods of contraception, to sterilization and abortion, to sub-fertility and artificial insemination, and to marriage counseling and sex education. The chapter with the latest information and which most widely interested the conference contains twelve papers on, "Research into Reproductive Processes and into Biological Methods of Controlling Fertility." Although some scientists were pessimistic, the majority opinion in this field seemed to hold that hope for not one but several safe, simple, completely reliable contraceptives adapted to different cultures might be entertained; but that a "perfect pill," universally satisfactory, is certainly not yet here nor could any prediction be made as to when one might appear.

The first two chapters in the Proceedings comprise 16 papers on the subjects, "World Population and Resources" and "Population Replacement as Affected by Changes in Birth-Rates." The former deals with population policies and pressures, with the relation of new technology to the subject (Dr. E. A. Ackerman), and with conditions in Bermuda, Britain, Ceylon, Egypt, Hawaii, Hong Kong (and Red China), India, Japan and the Western Hemisphere. The audience was startled by two addresses made close together. Each prepared with no previous knowledge of the other, they sounded like statement and confirmation. Warren S. Thompson, Director Emeritus, Scripps Foundation, U.S.A., gave the first lecture, courageous and scholarly, on "Population Pressure and Peace." Explaining that "population pressure" is often mistakenly identified as poverty and that poor peoples without outside help cannot afford war, he says the meaning of the phrase is actually relative. It must be thought of rather ". . . . as the way a people feels about its own economic condition compared with that of other peoples." He thinks such feeling is almost certain to increase and that the leaders will find it easier to argue that larger resources can only be obtained by war than to make it clear "that a slowly growing or even a stationary population would contribute even more surely to a better level of living." Shortly afterward, Professor Juitsu Kitaoka of Kokugakuin University took the platform. He first commented on the post-war aversion, (especially among intellectuals and the young) of the Japanese for militarism even for self-defense. But they hoped, he said, for a socialist or communist revolution, useless and disillusioning as that would prove. Then he added, ". . . but we cannot say what is to be the alternative. There is no guarantee that the Japanese will quietly endure mass starvation or a miserable standard of living far below that of other civilized countries. There is also no guarantee that the Japanese will not again set out on the mad and desperate trail attempted during the Pacific War."

The papers on eugenics will be of special interest to readers of this journal. Frederick Osborn, Secretary of the American Eugenics Society, contributes "Genetic As-

pects of Population Replacement." He examines the effect on selection created by reduced infant mortality and longer life, warning of the dangers inherent, when the death rate falls, in selection by variations in births. Unless birth differentials are diminished by the practice of family limitation in all classes, not only may a nation's cultural inheritance be changed but genetic deterioration becomes possible. He then outlines practical steps for combating these hazards. A most urgent reason for improving selection by a better distribution of births, he argues, lies in the increased rate of (usually harmful) mutations caused by increased radiation.

Dr. C. P. Blacker, Honorary Secretary of the Eugenics Society in Great Britain, traces the history of the "Family Planning and Eugenics Movement in the Mid-Twentieth Century" and includes a tribute to Mr. Osborn; Dr. S. Chandrasekhar, Director, Indian Institute for Population Studies, Madras, discusses the present dysgenic trend of family planning in India, Asia and Africa due to poverty and cultural barriers; Mrs. Avabai Wadia, Honorary General Secretary of the Family Planning Association of India, at the conference's eugenics study group made a plea for more eugenic research. She said that, so far in India, virtually no scientific study of family patterns had been undertaken.

The most extreme eugenic proposal offered appeared in a paper by an American, Elmer Pendell, Ph.D. Disregarding that keystone to the arch of democracy, the dignity and rights of the individual, he states in italics that unless a family can demonstrate better than average heredity, it should be socially restrained from more than average reproduction—and by the automatic operation of a sterilization law. He declares that the worth of the individual is steadily declining—particularly because there are too many of them—and that therefore the good of society should take precedence.

To judge from the Proceedings, one might suppose that Japanese interest in eugenics is relatively small. Unfortunately only summaries of most Japanese contributions appear in the English edition (conversely, English papers in the Japanese edition). Mr. Osborn, however, reports a very genuine interest among Japanese geneticists and a broad understanding of the larger aspects which he feels augurs well for the future of population studies in Japan. Certainly the word "eugenics" is familiar to the Japanese because of the government-subsidized consultation offices attached to every prefecture and city having a Health Center (783 in 1955) and because of the Eugenic Protection Law already mentioned. But the "eugenics" of that law applies only to sterilizing the unfit with no provision for encouraging reproduction of the best stocks. And the "offices" are primarily designed for mass education in contraception and for practical advice. A doubt would seem admissible that the public knows much of anything of the positive meaning of the word "eugenics"—the Greek *eugenes*, or "well-born."

Japanese geneticists are in general agreement that planned parenthood in Japan is not dysgenic. They say contraception has already spread among all classes and that the practice is bound to become more prevalent because of the Government program. At the same time they do think that the Government should encourage a higher birth rate among eugenically superior stocks.

Among other material in the Proceedings: reports from the fifteen (now eighteen) national family planning associations belonging to the International Planned Parenthood Federation; the address opening the conference by the organization's president, Margaret Sanger, entitled "Planned Parenthood: A Cultural Civilization Will Bring World Peace"; the welcoming speeches by members of the Japanese Government and of the Family Planning Federation of Japan; the greetings of the Governor of Tokyo and of the

leaders of the Socialist and the Liberal political parties.

Besides the wealth of international information on overpopulation and family planning made available in the Proceedings, the reader gains, as an unplanned by-product, a vivid impression of the Japanese character; their hopes and aspirations, their struggle and suffering, their courage, determination and persistence in the face of what many a people might consider insurmountable obstacles. An occasional glimpse of the American Occupation through Japanese eyes is revealing. The volume should make an important addition to any library, public or private.

This reviewer could wish that an index had been added for ease of reference and a separately listed, fairly comprehensive "Who's Who" of the authors. But even these suggestions seem petty in view of the success of an editing job surely gigantic.

In his "Editorial Note," Dr. Jackson reminds readers that the authors' opinions are not necessarily those of the International Planned Parenthood Federation. "Free discussion was allowed at the conference of any measures—however far from being universally acceptable or desirable—which might help to ameliorate the hard lot of certain countries."

DOROTHY H. BRUSH
Chairman
Brush Foundation for Race Betterment

THE HAZARDS TO MAN OF NUCLEAR AND ALLIED RADIATIONS: Medical Research Council, Her Majesty's Stationery Office, London, 1956, 128 pp., price 5s. 6d.

This pamphlet is probably the most complete and authoritative summary now available on the subject in the title. Drawn up by a committee of 17 eminent British scholars, it is exemplary in its organization, clarity, and scientific thoroughness. The principle chapter headings are as follows: The Nature of Radiation and its Action on Living Cells, the Effects of Radiation on the Health of the Individual, The Genetic Effects of Radiation, Existing and Foreseeable Levels of Exposure to Radiation, and Assessment of the Hazards of Exposure to Radiation. In addition to 81 pages of text, there are 13 appendices totaling 45 pages and constituting a collection of original, relevant scientific papers. Although the booklet was apparently not intended as a reference and includes no index, access to most of the topics is possible through the detailed table of contents or through the summary, which gives paragraph references.

The report is exceptional in that it presents a simple but effective introduction to relevant terms and concepts in both radiation and genetics. The section on effects in the individual includes a detailed discussion of the data on specific types of injury. The section on genetic effects considers the probable consequences of doubling the present human mutation rate. The next section adds up the radiation from all sources now affecting the British population.

The crucial question is the number of mutations resulting from a given dose of radiation. Reluctant to depend entirely on animal data, the authors derive an absolute lower limit for the radiation that would double man's mutation rate, namely 3 roentgens, or the present background radiation. With the aid of animal data they then fix the probable range at 30 to 80 *r*. This coincides precisely with the range suggested in the summary report of the Committee on Genetic Effects of Atomic Radiation, of the National Academy of Sciences in this country. The British estimates of background and present artificial radiation, however, are lower than the American estimates.

In its conclusions, the report takes cognizance of the fact that all radiation is potentially harmful and suggests that average exposure of the population to artificial radiation should never exceed about 6*r* per 30 years or twice the background radiation. The report states that an individual should not be allowed to accumulate more

than 50 *r* of radiation to the reproductive glands from conception to the age of 30 years, or 200 *r* of "whole body" radiation during his lifetime. "The present and foreseeable hazards from *external* radiation due to fall-out from the test explosions of nuclear weapons . . . are negligible." But with respect to *internal* radiation from radioactive strontium due to fall-out, an increase in the rate of thermonuclear testing might produce ill effects. With respect to wartime hazards, the committee finds it "difficult to imagine the general occurrence of radiation intensities which would eliminate the entire human race."

"As an essential basis for future studies of the genetic effects of radiation, further data are required on the genetic structure of human populations; to this end, there is an urgent need for the collection of more detailed information, when births, marriages and deaths are registered."

GORDON ALLEN, M.D.
Laboratory of Socio-Environmental Studies
National Institute of Mental Health

MENTAL DISORDERS IN LATER LIFE (Second Edition): Oscar J. Kaplan (ed.), Stanford University Press, Stanford, California, 1956, 508 pp., $7.50.

The first edition (1945) of Kaplan's collection of articles dealing with the physiological, psychological, sociological and psychiatric aspects of advanced age proved to be a valuable reference work for all those interested in the problems of gerontology. The book fulfilled its purpose of indicating "the level of achievement in this area."

While the original volume consisted of 17 chapters contributed by 17 authors from different disciplines, the second edition contains 19 chapters by 21 contributors and a total of over 1,000 bibliographical references. The editor's introductory statement that "the field of gerontology has experienced tremendous growth" during the intervening ten years is entirely correct but is not fully borne out by the changes which have been made between the two editions. This comment should not be construed as a criticism of the editor who deserves much credit for his well-intentioned undertaking but is supposed to call attention to the rather regrettable fact that basic knowledge in this rapidly expanding discipline is still inadequate, despite a great number of research projects organized during the past decade.

Apart from several chapters which have been reprinted verbatim, there are a few others with only minor changes. However, the excellent chapters by Jones and Kaplan on "Psychological Aspects of Mental Disorders in Later Life" and by Kaplan on "The Aged Subnormal" have been fully revised, and the same holds true for Stieglitz' concluding chapter on "Orientation of the Problems." In this stimulating and well-formulated contribution, the author emphasizes the need of developing a discipline of preventive (constructive) medicine for the senescent population.

Malzberg's statistical survey of mental disorders in later life replaces the chapter which Pollock contributed to the first edition. The revised data provide valuable information about death rates, causes of death, and first admissions to New York State hospitals as of 1948-1950, together with some statistics on diagnostic categories, marital and educational status, race and nativity, and residential and economic classifications.

As a replacement of Wexberg's original account of specific metabolic disorders in later life, McCay's chapter on "Food for the Later Years" is a definite improvement. In a challenging discussion of the nutritional needs of the aged, the author stresses the fact that malnutrition in the senescent population is primarily a socio-economic problem. In 1951, for instance, the food allowance for old people living alone on relief in the central sections of New York was only $26.50 per month.

One of the most stimulating sections of this chapter is the one dealing with the importance of community action in an at-

tempt to improve nutritional conditions for the aged. It is reported in detail how New York State hospitals aim at providing adequate diets at low cost for their elderly patients. The only disappointment may come from the fact that little is said about the part played by dietary factors in the etiology of atherosclerosis, a much-studied and still highly controversial subject of contemporary medicine. According to the author, "the evidence is too imperfect to justify cessation in the use of such valuable foods as those that contain cholesterol on the grounds that they may help older individuals avoid arteriosclerosis."

Of particular value are two entirely new chapters, one by Kallmann on "Genetic Aspects of Mental Disorders in Later Life" and the other by Prout, Allen and Hamilton on "The Use of Electric Shock Therapy in Older Patients." In latter chapter, the following four points are stressed for the use of electroshock in the treatment of patients over age 60: (1) the presence of "a mental illness which is fundamentally functional in nature"; (2) previous opportunities "to respond adequately to the usual more conservative forms of psychiatric therapy"; (3) careful evaluation of the adequacy of the cardiovascular system; and (4) curarization by properly trained physcians to minimize complications.

The inclusion of a new chapter on the genetic aspects of aging reflects the increasing recognition which the discipline of human genetics has received during the past ten years, not only in the field of gerontology, but in clinical medicine in general. The authoritativeness of the author in this area needs no particular emphasis here.

In Dr. Kallmann's opinion, the possible effect of the genetically determined influences upon mental disorders in later life may express itself in the following three different ways: (1) in the occurrence of hereditary disorders prior to the period of senescence, (2) in the operation of genetic factors in the determination of the "normal average ability of man to survive till and and through the period of old age," and (3) in the role that heredity may play "in the etiology of mental disorders which are peculiar to the period of senescence." Pertinent data are presented with respect to these three areas, but the conclusion is drawn that "adequate progress in the management of the clinical and psychological aspects of geriatrics will not be possible without a more thorough knowledge of the genetic background factors, which primarily determine man's variable capacities for maintaining a state of physical and mental health throughout life, including the senium."

Beyond question, the revised book fills a definite gap in the field of gerontology and should be read by every worker concerned with the adjustive problems of our aging population.

LISSY F. JARVIK, M.D.
Department of Medical Genetics
New York State Psychiatric Institute

ZWILLINGSTUBERKULOSE III — Nachuntersuchung nach 20 Jahren an der Serie tuberkuloser Zwillinge: Helmut Mitscherich, Gustav Fischer Verlag, Stuttgart, 1956, 78 pp.

The widely known study of tuberculous twins by K. Diehl and O. von Verschuer, published in two volumes (1933 and 1936), was the first major investigation undertaken jointly by a geneticist and a clinician. We are indebted to the authors of this great work for a demonstration that a chronic infectious disease can be studied genetically in spite of the many obstacles imposed by the unruly behavior of the disease, and above all by the time factor. Significantly, the investigation was planned with a view to a complete, long term follow-up which is now concluded. The final results are reported in the above monograph which thus constitutes volume III of the study.

From the original sample of 239 twin pairs, 118 pairs could still be traced in spite of the war and of the necessity to

limit the follow-up to Western Germany. The present report deals with 40 identical and 62 fraternal pairs in whom a major tuberculous disease was present at the outset of the study. No new cases were added and thus the sample has the character of a cohort, followed for 20 years after discovery of the disease. The statistical meaning of the shrinkage of the sample has not been evaluated, neither is it known if any selection was introduced by the unfortunate reduction. The case histories of all pairs are presented with essential clinical information in tabular form. The cases of chronic pulmonary disease of the adult type are also given narratively, with detail adequate for comparison with other samples.

On the whole, the additional period of observation confirmed the contrasts between identical and fraternal pairs that had been seen at the outset of the study. Some very suggestive differences in the course and clinical outcome of the disease between the two categories of twins are pointed out, and are held by the author to be evidence of genetic determination. (Only the groups with the typical chronic pulmonary disease of the adult type will be considered below.) The relative intra-pair similarity remained unchanged, the identicals showing a distinct preponderance of likeness within pairs over the fraternals throughout the follow-up period. In fact, the author suggests that in identicals with both twins affected, there was an increasing intra-pair likeness, but the data seem to be inconclusive. The finding that only in identicals were there pairs in which both members died of tuberculosis is considered by the author as signal evidence of genetic determination. Further suggestions of genetic differences are inferred from the proneness to disease in the other, originally healthy twin. Among the 34 fraternal, originally discordant pairs, only once did the healthy member also develop tuberculosis, whereas among the corresponding 11 identicals, six pairs thus became concordant. Moreover, in fraternal discordant pairs, a fatal outcome was found in 19 of 34 pairs, whereas in the 11 identical discordant pairs this occurred only once. This difference indicates a high level of resistance in identical pairs in whom only one member was affected.

These results invite comparison with the observations made in a similar American investigation (Kallmann and Reisner, *Am. Rev. Tuberc. 47*, 1943: 549; Planansky and Allen, *Am. J. Human Genet. 5*, 1953: 322). Generally, the trends reported by Mitschrich were noted also in the follow-up study of the American sample, but similarity and dissimilarity of the disease process did not correspond so closely with identical and fraternal twin groups. Evidently, the two samples are not entirely comparable either as to the demographic characteristics of the studied populations or as to the length of the follow-up periods. In view of the very complex and largely fortuitous nature of many factors that may tip the balance between death and survival in a chronic illness, a tendency toward similarity in identical pairs might be obscured in some studies and not in others.

The present monograph will be of great interest to clinicians who may enjoy checking their prognostic views with these unique case reports, and should be examined by the officials responsible for public health. A geneticist may find some useful hints as to the practical planning of long range studies, and may be impressed with the evidence obtainable from clinical twin material, where the heritable factors proper are neither identified nor amenable to direct measurement.

KAREL PLANANSKY, M.D.
Veterans Administration Hospital
Canandaigua, N. Y.

LAND OF THE MOON-CHILDREN—THE PRIMITIVE SAN BLAS CULTURE IN FLUX: Clyde E. Keeler (Georgia State College for Women, Milledgeville, Ga.) University of Georgia Press, 1956, 207 pp., $4.50.

After spending five summers among the Cuna-Caribe Indians on the San Blas

Islands off the north coast of Panama, the author presents this highly readable account of his personal experiences and observations, in effect an ethnographic study, emphasizing sociological and religious traits. Much of the primitive survives despite more than four centuries of contact with Europeans and Americans. He sketches Cuna-Caribe history from the landing of Balboa, when these Indians inhabited most of the Isthmus and numbered some 750,000, contrasted with about 20,000 today; and he outlines their present problems of adaptation to modern influences.

This journal's readers will be particularly interested in the last ten pages, devoted to the albinistic "Moon-children," believed to be the result of their mothers' gazing at the moon during pregnancy. After mentioning the absence of pigment in skin, hair and iris, the dry and wrinkled condition of the skin, long but very fine blond body hair, etc., all of which has been recorded by several others, the author describes associated traits to which he attaches special importance. They are recited here because they apparently constitute a "pleiotropic syndrome" involving not only morphological features but also physiological phenomena and psychosomatic behavior. They include reduced basal metabolism, hands which are frequently "cold and clammy," urine of low specific gravity, chronic heads colds in the nose and throat, reduced strength of grip as tested with the dynomometer, slow movements and gait, diminished endurance in all physical activity, retarded adolescent development, definite lack of facial expression and feebleness in smiling, soft voice, and reputation for stubborn disposition and hot temper. Intelligence is apparently normal.

While the syndrome is inherited as a recessive trait, heterozygous females are almost always light brown in skin color and heterozygous males are frequently so. No other partial manifestation of the gene is mentioned. The trait is not sex-linked, however.

Its incidence in the population is estimated at 1.75 per cent, making subjective allowance for infanticide, which used to be practised extensively on "Moon-children" and has not yet disappeared completely. A similar type of albinism has been reported among other Indian populations including the Mayas of Guatemala, Aztecs of Mexico and Navajos of the United States. A few such cases have been described sufficiently to suggest that they may be produced by the same gene.

RICHARD POST
Institute for Study of Human Variation
Columbia University

WARBASSE HISTORY—A Study in the Sociology of Heredity: James Peter Warbasse, Kendall Press, Falmouth, Mass., 1954, 226 pp. $3.00.

This book deals with 13 generations of ancestors of the author, long a surgeon and internationally active in the cooperative movement and the author of 5 books, including *Medical Sociology*. It also discusses 8 generations of descendants of Peter Warbasse who came from Denmark to America in 1753 as a Moravian missionary. It sketches 325 individuals sociologically. It was completed in 1953 when the author was 87, after many years of research by him and his secretary. It is scholarly, effectively presented, and worthy of the attention of those interested in Puritans, Quakers, Moravians or in the life of Americans in New England, eastern New York and western New Jersey from pioneer times to the 1860's.

The people discussed are overwhelmingly substantial, worthy folk though very few were distinguished. A governor of Massachusetts and the author were perhaps the most prominent. The 6 generations especially studied are notable partly because "they throve, enjoyed happiness and a capacity for originality and leadership, lived in harmony and without divorces or domestic tragedies. . . ." "They found happiness in living usefully in knowledge, in-

dustry, truth, honesty, charity, generosity and in beauty." "The records disclose no ancestor who was psychologically or ethically abnormal. . . . There is no insanity, no crime, no drunkeness, no unsocial law breaking, no poverty, no known marital infidelity, no crippled or deformed . . . a series of wholesome, respected people. There were no geniuses, no greatness, no large wealth."

"The satisfaction of geneological research depends not upon the discovery of ancestors of nobility but upon the discovery of generation after generation improving upon the quality of its predecessor. . . . This gives the individual an incentive, even an obligation, to maintain a tradition of excellence and improvement."

The reviewer is reminded of the Conant family which for 7 generations lived quietly in Massachusetts and then produced a world figure, J. B. Conant. Any one who reads in this book will find considerable illumination and inspiration.

STEPHEN S. VISHER
Indiana University

PERIODICAL ABSTRACTS

GENETICS

The causes of mongolism. Jacob Oster. *Danish Medical Bulletin* **3** (1956), pp. 158-164.

Danish data do not offer much support for a genetic theory of mongolism. Relatively advanced age of the mothers and evidences of impaired reproductive functions were the only positive clues to etiology in this study. The author registered 1006 mongoloids born in a defined section of Denmark between 1923 and 1949, and personally investigated the families of 526 who were still alive. Among 343 younger sibs, four were mongoloid, as compared with 1.41 expected from the ages of the mothers at these births. This excess is not statistically significant. In contrast, maternal age is very significant. The risk of having a mongoloid baby is 29 times as great for mothers aged 45 to 49 as for those aged 15 to 19. The author believes that mothers who have had a mongoloid child need not fear that their next baby will be mongoloid more than other women of their age.

Individuality in the behavior of chimpanzees. H. W. Nissen. *American Anthropologist* **58** (1956), pp. 407-413.

Chimpanzees show a diversity of behavior quite comparable to that found in man. Despite great uniformity of the environment of apes born at the Yerkes Laboratories of Primate Biology in Florida, individual differences are seen in activities ranging from mode of locomotion to problem solving and social know-how. If allowance is made for their more limited repertoire, the Yerkes Laboratory's 57 apes show behavior "as distinctive as an equal number of people drawn from any place on earth." An experiment has been planned in which a number of baby chimps will be raised in each of several rigidly controlled environments, to permit study of personality and behavior differences that can be attributed to heredity.

Phrenophagia: a form of human artificial selection. J. M. Radzinski. *American Journal of Psychiatry* **113** (1956), pp. 312-318.

Since the first invasion by Mongols in 1236, Russia has been the scene of recurring suppressions, massacres and deportations which would seem to be clearly dysgenic in their effects. The continual elimination of persons with independent spirit has been matched by a tendency to favor unscrupulous conformists. The resulting degradation of genetic capacities of spirit and intellect in Russia and in areas under her control should be a matter of concern to the rest of the world.

Although the processes described in this article would seem to operate in an unfavorable direction, they may have been partly or entirely offset by other selective forces not considered by the author. In any event, intellectual qualities have a complex origin, and normal genetic traits are known to be extremely stable. It is therefore questionable whether such irregular selection as this could have had serious genetic consequences in the course of a few centuries. Except when selection approaches the point of annihilation, species are well protected against the buffetings of the environment.

A specific chemical difference between the globins of normal human and sickle-cell anaemia haemoglobin. V. M. Ingraham. *Nature* **178** (1956), pp. 792-794.

The mutation responsible for sickle-cell anemia in man affects only a very small segment of the essential protein molecule, globin. The author devised an ingenious combination of the three methods much used in biochemical analysis: partial enzymatic digestion, electrophoresis, and chromatography. With this method he analyzed the globin molecule into 30 dissimilar

pieces, each consisting of two or more amino acids. It was possible to show that 29 of the 30 fragments or peptides were the same in sickle-cell and normal hemoglobin, and that the remaining peptide was altered only slightly. If this chemical alteration represents the primary effect of the sickle-cell gene, it is a striking demonstration that mutations may act on units much smaller than entire protein molecules, and that a minute change in a protein molecule may have far-reaching effects.

Migrane bei Zwillingen, vorlaufige Mitteilung. (Migraine in twins, preliminary report.) H. C. Ebbing. *Acta Geneticae Medicae et Gemellologiae* **5** (1956), pp. 371-382.

Findings in 19 pairs of twins rule out any simple dependence of migraine on heredity. In three pairs considered identical, the partner had frequent or severe headaches but not true migraine. Of 10 pairs considered fraternal, one pair contained two members with typical migraine, and in two pairs the partner reported frequent severe headaches. However, most of the patients with migraine had additional signs of dysfunction of the vegetative nervous system, and in this respect the one-egg pairs were all alike. The author suggests that this dysfunction may be hereditary and one of the causes of migraine.

It should be noted that the hereditary dysfunction postulated by the author is not a sharply defined entity, and that, by his own data, it is neither a necessary nor a sufficient cause of migraine.

Micro-evolution in a human population: a study of social endogamy and blood type distributions among the Western Apache. B. S. Kraus and C. B. White. *American Anthropologist* **58** (1956), pp. 1017-1043.

Three bands of Apache Indians show differences in blood-group frequencies that may correspond to the much larger differences between major racial divisions of mankind. The known tribal history rules out significant introduction of non-Apache heredity and, in fact, marriages are mainly confirmed within the same band. However, close inbreeding in the genetic sense is largely prevented by marriage rules. The populations have been so numerous since 1800 that according to genetic theory, chance "drift" cannot explain the observed blood-group differences. Comparisons among three generations now alive show that blood-group frequencies have been stable for at least the past 60 years. The authors therefore conclude that the diversity among the Apache bands resulted from genetic drift before 1800, when the bands were small.

GORDON ALLEN, M.D.
Laboratory of Socio-Environmental Studies
National Institute of Mental Health

POPULATION

College study report — 1956. Population Reference Bureau with the assistance of P. K. Whelpton and Patience Lauriat. *Population Bulletin* **12**, 6 (October, 1956), 89-105.

This is the tenth in a series of annual studies of the fertility of college graduates and the first in which the Population Reference Bureau has been joined by the Scripps Foundation for Research in Population Problems in the analysis of the data. The information used was obtained by mail questionnaires from 11,068 graduates in the Classes of 1931 and 1946 of 95 colleges with an enrollment of 500 or more.

That college graduates are clearly participating in the baby boom is demonstrated by the fact that, among the men, graduates of ten years ago have nearly as many children per graduate as graduates of twenty-five years ago (1.90 as compared with 2.09). The ten-year women have already surpassed the twenty-five-year women (1.70 to 1.55). All of the groups are nearer to the replacement level of 2.15 children per graduate than any of the other

classes studied during the last decade.

For graduates of twenty-five years ago, the highest number of children per parent (3.36 for males, 3.18 for females) and per married graduate (3.08 for males, 2.62 for females) is shown by the Roman Catholic colleges, while the Mormon colleges have the highest number per graduate (2.95 for males, 2.45 for females). In the ten-year class, the Mormon colleges lead in all three categories, presumably reflecting a tendency for Mormons to marry and have children at younger ages that Catholics.

Other findings of the study include a decreasing proportion of childlessness among college graduates, a higher proportion married among the ten-year women than among the twenty-five-year women, and the absence of any important difference in proportion married between women graduates of coeducational colleges and graduates of non-Catholic women's colleges.

The gradually accumulating data of these annual studies are a valuable addition to the resources of students of fertility. While the comparative costs of possible uses of the available funds may have made mandatory the elimination of the colleges with an enrollment of less than 500, the reviewer regrets that this omission from the sample has been made. The number of cases obtainable from these colleges may be too small to give reliable statistics for individual institutions, but the performance of the group as a whole is of some interest.

Une enquête sur l'opinion publique à l'égard de la limitation des naissances. Alain Girard and Raul Samuel. *Population* 11, 3 (July-September, 1956), 481-506.

A recent article by the *Institut national d'études démographiques* (reviewed in the last issue of *Eugenics Quarterly*) sought to describe what is scientifically known about the possible effects of changes liberalizing French law with regard to birth limitation and counseled a policy of proceeding slowly in an area characterized by diverse objectives and a shortage of firm knowledge. A similar suggestion concludes this report from the same institute on a survey of French public opinion: "Prudence is to be recommended to those responsible for action" (p. 506).

The data upon which this admonition is rested were obtained in interviews during May and June, 1956, with 2,432 people. The sample closely resembles the total French population as to age, sex, size of city of residence, geographical region, and occupation, except for some underrepresentation of workers (*ouvriers*). The respondents proved in general to know that the French birth rate has been higher than before the war but to have little knowledge of the state of affairs in other countries. Fewer than half were aware that widespread discussion of birth limitation is now under way in France.

In addition to their views on the desirability of relaxing the laws that restrain the distribution of contraceptive information and materials, the respondents were asked for opinions on the desirability of introducing sex education in the schools, private marriage counseling agencies, birth control clinics, and authorization for doctors to give birth control information. They were also asked whether they thought the number of births in France was too high or too low and what effect relaxation of the anticontraception laws would have on that number.

The results indicate that the French population is much divided on these questions, with age and religion importantly associated with the division, while the effect of occupation is less clear and the effect of sex is almost non-existent. Forty-three per cent of the respondents favored, and the same proportion opposed, changes in the law, but on each side varying degrees of support and opposition appeared. Only 9 per cent opposed and 18 per cent favored all the innovations mentioned in the first sentence of the preceding paragraph. Even among those who reported themselves as practicing Catholics, 24 per cent favored

general liberalization of the law and 38 per cent approved freedom for doctors to dispense birth control information. An association appeared between judgments that the current birth rate is too high and opinions that contraception should be made more available. This is interpreted to indicate that positions taken on birth control are linked to views as to the optimum level of fertility, though individuals working for changes in the law have often sought to dissociate personal and community problems.

In the authors' view, their most important finding is a general agreement that liberalization of the law would lower the birth rate. Though the unanimity on this point among both those who favor and those who oppose liberalization is clear, the reviewer would be less inclined than the authors to pass over the distinction between those who expect a "weak diminution of births" and those who expect a "strong diminution." The supporters and opponents of liberalization were divided very differently between these categories.

Roman-Catholicism and fertility in the Netherlands: demographic aspects of minority status. F. van Heek. *Population Studies* **10,** 2 (November, 1956), 125-138.

Among Western countries, the Netherlands has been distinguished in recent decades by the exceptionally high level of its birth rate. This article, based on two lectures that summarized a study published in Dutch, touches upon a wide variety of topics related to the contribution of Roman Catholics to high fertility in the Netherlands. Among the subjects considered are the determination of whether Holland is overpopulated, the effects of agricultural organization and technology on the birth rate, a comparison of the birth rates of Dutch Protestants and Catholics with those of coreligionists in neighboring countries, and the sociology of religion and the social history of the Netherlands. The position of the Dutch Catholics as a large minority influenced by early suppression, by a present hope of becoming a majority, and by the Calvinists' example of rigorous religious adherence, appears to have been significant in producing Catholic fertility that has been higher than Catholic fertility in other countries and has contributed significantly to the high Dutch birth rate.

Readers will find the article an interesting introduction to its subject, though not altogether successful in its attempt to bring together a wide range of materials. Those able to do so will wish to refer to the original study (cited on p. 125) for more information as to the kinds of data gathered and the quantitative results of the investigation.

Marital role tensions and number and sex of children. Bernard Farber and Leonard S. Blackman. *American Sociological Review* **21,** 5 (October, 1956), 596-601.

To get a longitudinal view of the effect of the number and sex of children on marital role tensions, the authors utilized data for 211 white Chicago couples collected three and fourteen years after marriage for the Burgess and Wallin marriage prediction study. An index of marital tension was constructed from the husbands' and wives' ratings of themselves and each other on eleven personality traits. A factor analysis of the personality data was made to determine which traits to include in the index, but, for reasons that are not clear in the article, the actual list of traits employed differed somewhat from that furnished by the analysis.

Several hypotheses suggested by the findings of earlier studies were tested, most of which received no support from the data. Thus, while number of children was significantly related to fourteen-year marital tension, this effect was not significant when the level of marital adjustment after three years of marriage was held constant. The closeness with which family size reported as desired after three years of marriage was actually realized after fourteen years appeared to be unrelated to shifts in marital

tension scores in the intervening years. The proportion of girls among the children also had no significant effect on marital tension. Among the factors investigated, the only one shown to be significantly related to fourteen-year marital tension was three-year marital adjustment.

At least two matters not considered by authors, presumably because of an absence of the necessary information in the available data, seem to the reviewer to be candidates for inclusion in future studies of this kind: the difference between desired and achieved sex distribution of children, and the difference between achieved number of children and the number desired at the time of the *second* collection of data.

The trend of the birth rate in India, 1911-50. A. Ghosh. *Population Studies* **10,** 1 (July, 1956), 53-68.

In this article the author attacks the problem of estimating from the registered figures the true course of the birth rate of India from 1911 to 1950, using an adjustment formula he had developed in an earlier study of Bengal. The procedure assumes that in six provinces that have shown a decline in the birth rate, the registration of births in each decade has in effect been the registration, with a fixed percentage of underenumeration, of the births to a population held constant at the size of that of the base period. Underregistration in later years is thus the resultant of two components, the initial rate of underregistration and the subsequent actual growth of the population. For those provinces that have reported relatively constant birth rates, the percentage of underregistration was taken to be constant over the entire period.

These assumptions were used to derive corrected birth rates for each of the provinces studied and for all of India that had previously been part of British India. For India, the reconstructed birth rates were 45.5 for 1911-20 and 38.8 for 1941-50, as compared with registered figures of 37.5 and 27.5, respectively. The article also deals with underregistration of infant deaths. The main conclusion is that the level and regional differentials of Indian fertility changed very little between 1911 and 1950.

While readers may be impressed by the difficulty of such an analysis and the simplifications it requires, there seems little doubt that the final result is closer to a true picture of Indian fertility than the registered statistics.

The public health worker and the population question. John J. Hanlon. *American Journal of Public Health* **46,** 11 (November, 1956), 1397-1404.

A comment frequently made about the growth of world population in the last three centuries is that successful attempts to save lives through improved health may be looked upon as important contributors to serious population problems in various countries. This article seeks to arm public health workers against the attacks of those who accuse them of irresponsibility because of their efforts to prolong life.

A general review of some of the factors that have contributed to population change, which contains little that will be new to readers of *Eugenics Quarterly*, points out that while public health measures have been only one of many influences, they have indeed been a major element in the acceleration of population increase. The author suggests, however, that the time-lag between mortality declines and fertility declines may possibly be reduced in the future.

The article concludes with some eight recommendations to public health workers, which center around the idea that both research and field programs should be broadly based, seeking to relate public health problems and policies to those of related areas. Among other things, it is recommended that "we should encourage changes

in those cultural patterns and values which are not consistent with the desirable results of public health activities" (p. 1404).

The utilization of alternative population forecasts in planning. H. V. Muhsam. *Bulletin of the Research Council of Israel* **5C,** 2-3 (March-June, 1956), 133-146.

For many purposes it would be desirable for policy planners to have accurate knowledge of what the population of a given area will be at some future date. Unfortunately it is by now clear that the available techniques for population forecasting do not furnish such precise knowledge. The purpose of the article under review is to outline a procedure by which uncertain population forecasts might be set forth and used in such a way as to permit their uncertainty to be taken specifically into account.

The scheme suggested involves three phases: assignment of probabilities to alternative population forecasts; establishment of a quantitative loss function for each use of the forecasts, stating the cost involved if the forecast chosen turns out to be in error by various amounts; and agreement upon a policy criterion stating what risks the policy planner would prefer to run. Some hypothetical examples of the application of this sort of analysis are presented to illustrate the method. The author concludes that the chief weakness of the scheme is the inability of demographers to furnish forecasts with probability distributions, but he believes that if sufficient pressure is brought to bear they will develop the necessary methods.

While it appears to the reviewer that this is an interesting line of attack, and worth exploring, the nature of population forecasts is such as to leave him less optimistic than the author as to what demographers may be able to accomplish. The principal hope in the indicated direction would seem to lie in a thorough canvas of the suitability for decision analysis of very simple assumptions about the "probability distribution" of future populations.

George F. Mair
Smith College

ANNUAL MEETING OF THE AMERICAN EUGENICS SOCIETY

November 14, 1956

By order of the Board of Directors the Annual Meeting was held at 3:00 P.M. on Wednesday, November 14, 1956, at 230 Park Avenue, New York City. Nine members were present and 130 voted by proxy. Mr. Osborn presided as Chairman *pro tem* until the President, Harry L. Shapiro, took the chair.

The fiscal report for 1955 was presented by the Treasurer, Mr. Belknap, along with the current financial report as of the end of October 1956. Both reports were approved.

The following nominees for directors for the class of 1958 were elected:

> Chauncey Belknap, C. Nash Herndon, Franz J. Kallmann, Frank Lorimer, Mrs. Emily H. Mudd, Frederick Osborn, Sheldon C. Reed, Harry L. Shapiro.

The interim appointments for the class of 1957 of Dudley Kirk and Mrs. Dorothy Brush, as made by the Executive Committee, were approved.

Two of the nominees declined their nomination. It was suggested that the Executive Committee consider substitute nominees.

Dr. Shapiro asked for suggestions for strengthening the Society's program.

The following suggestion was discussed.

> The preparation of a selective bibliography on eugenics and related subjects to be published in *Eugenics Quarterly*. This might also include material published in other journals, pointing out what interests they have in common and how they differ in their approach.

No action was taken, and the matter was referred to the officers and the Executive Committee of the Society.

The meeting was adjourned at 3:45 P.M.

Respectfully submitted,
FREDERICK OSBORN
Secretary

Meetings

The Thirty-third Annual Conference of the Milbank Memorial Fund, held at the New York Academy of Medicine, October 31-November 1, 1956, devoted one section to "The Nature and Transmission of the Genetic and Cultural Characteristics of Human Populations. The program was as follows:

Chairman: Dr. Lowell J. Reed

I. *Factors Influencing the Characteristics of Populations*

1. A Modern Concept of Heredity in Relation to Man — Theodosius Dobzhansky
2. Impact of Culture on Genetic Mechanisms — Harry L. Shapiro
3. Cultural Dynamics Affecting Population Characteristics — Rupert V. Vance

II. *Identification, Distribution, and Fertility of People with Variant Characteristics*

1. Significance of Personality and Intelligence Tests in the Evaluation of Population Characteristics — William R. Thompson
2. A Survey of the Prevalence of Mental Deficiency in Delaware — Joseph F. Jastak
3. A Community Study of Mental Health: Preliminary Findings on the Extent of Psychiatric Disorder and Its Relation to Social Environment — Dorothea C. Leighton, M.D.
4. Appraisal of Existing Data on the Fertility of the Socially Handicapped and Gifted People — Dudley Kirk

III. *Research on Genetic Factors in Characteristics of Populations*

1. The Genetic Base: Pathways Between Genes and Behavioral Characteriestics — John L. Fuller
2. Genetic Aspects of Mental Disorder — Gordon Allen, M.D.
3. Appraisal of Potential Contribution of Longitudinal Twin Studies — Frank Falkner, M.D.

The Second Symposium on Population Problems was held at the University of Minnesota by the Center for Continuation Study of the General Extension Division in Minneapolis from January 28-30, 1957. The program was as follows:

I. Introducton, J. M. Nolte
II. Review of 1948 Symposium and Preview of 1957 Symposium, Warren S. Thompson
III. Population Changes in the Last Generation, P. K. Whelpton (Discussant, Robert C. Cook)
IV. Minimum Subsistence, Ancel Keys (Discussant, Ralph Manley)
V. Optimum Rates of Population Growth, Dudley Kirk (public meeting)
VI. The Man-Land Ratio, Jan Broek
VII. The Equilibrium Population, E. S. Deevey, Jr.
VIII. Economic-Technological Aspects of the Problem of Population Pressure on Resources, Athelstan Spilhaus (Discussant, Philip Raup)
IX. Genetic Changes, Karl Sax (Discussant, Sheldon Reed)

X. Cultural Aspects of the Problem, Robert Spencer (Discussant, Alex Weingrod)

XI. The Role of Science: The Changing Concept of Our Resources Base, Arnold Harberger

XII. Summary and Comments, Warren S. Thompson, Dwight Minnich, Robert C. Cook

AMERICAN EUGENICS SOCIETY
230 Park Avenue, New York 17, N. Y.

PRINTED MATERIALS

SPRING-SUMMER, 1957—reprints, pamphlets• available at 25¢ a copy

SPECIAL SERIES: *Radiation and Genetics*

Genetics in the Atomic Age, Curt Stern

Estimation of Spontaneous and Radiation-induced Mutation Rates in Man, James F. Crow

General Eugenics

Galton and Mid-Century Eugenics: The Galton Lecture, 1956, Frederick Osborn

Research on Intelligence and Personality (Committee Report, American Eugenics Society)

Fertility Control in the Light of Some Recent Catholic Statements, Parts I and II, Wm. J. Gibbons, S.J.

European Heredity Registers, Jan A. Mohr

Present Status of Research on Populations, Frank A. Lorimer

Dynamics of Human Populations, Dudley Kirk

Genetic Aspects of Population Replacement, Frederick Osborn

Relation of Population Changes to Distribution of Genetic Factors: World Population Conference Report

Tested Intelligence and Family Size, Anne Anastasi

Future Fertility of American Women, P. K. Whelpton

Female Sterilization in Puerto Rico, J. Mayone Stycos

Effects of Differential Fertility on Genetic Endowment, Frederick Osborn

Heredity and Learning Ability in Infrahuman Mammals, J. P. Scott

Trends in Capacity for Intelligence, Frank A. Lorimer

Address of Pope Pius XII to Primum Symposium Geneticae (1953)

Effect of Birth Control on Intelligence and Character of Succeeding Generations, Frederick Osborn

Eugenics and Health

Genetic and Eugenic Aspects of Early Total Deafness, Diane Sank and Franz J. Kallmann

Hereditary Susceptibility in Rheumatic Fever, May G. Wilson, M.D.

Treatment in Hereditary Diseases, Bertha M. Aschner, M.D.

Influence of Heredity on the Health of the Family, Barton Childs, M.D.

Heredity and Diabetes, Arthur Steinberg

Heredity and the Eye, Conrad Berens, M.D.

Heredity of Joint Diseases, Robert M. Stecher, M.D.

Eugenics and Preventive Medicine, C. Nash Herndon, M.D.

Eugenics and the Family

Psychiatry and Marital Problems, Emily Mudd

Education for Personal and Family Living, Frederick Osborn

*Heredity Counseling: Its Services and Centers, Helen G. Hammons

Scandinavian Family Allowances, Halvor Gille

Marriage and Family Research, Reuben Hill

Sex Education and Eugenics, Jacob Goldberg

*Preparing for Parenthood, Frederick Osborn

Family Allowances in Brtain, Canada, Australia, New Zealand, R. Chambers

International Family Legislation, Helen G. Hammons

Contribution of Planned Parenthood to the Future of America, Frederick Osborn

---

BACK ISSUES—EUGENICS QUARTERLY, Volumes 1 to 3 (1954-1956) and *EuGenical News*, Volumes I to XXXVIII (1915-1953) available.

1957: EUGENICS QUARTERLY, Volume IV—Journal of the American Eugenics Society. 64 pages; population, genetics, reviews, etc. $3.00 a year, *sample copy free.*

AMERICAN EUGENICS SOCIETY

230 Park Avenue, New York 17, New York

( ) I would like to subscribe to EUGENICS QUARTERLY ($3.00)

( ) Please send the titles checked above. (Any single copy $.25. Any five copies for $1.00. Quantity rates on request. Also quotations on back issues.)

Please enclose payment with order; stamps accepted

Name _____

Address _____

SUGGESTIONS FOR CONTRIBUTORS TO EUGENICS QUARTERLY

EUGENICS QUARTERLY, the official journal of the American Eugenics Society, publishes original articles on population, genetics, family life, and other fields related to eugenics and the quality of populations. Its contents are directed both to scientists and laymen. It is the only periodical in the United States devoted solely to eugenics. Original manuscripts, unpublished elsewhere, will be welcomed for consideration by the Editorial Board, and they should be sent to: Editor, EUGENICS QUARTERLY, 230 Park Avenue, New York 17, N. Y.

A great deal of interest has been shown in EUGENICS QUARTERLY in countries outside the United States, and the journal is particularly glad to receive contributions from overseas.

Manuscripts: One original and one carbon should be submitted, typewritten and double-spaced. Legends for figures and plates should be typed and clearly marked on separate sheets.

Illustrations and Tables: Half-tones and line drawings can be printed in limited quantity. Tables and pedigrees should be composed to fit a type page 8x5½ inches.

Footnotes: should be numbered 1, 2, 3 consecutively.

Headings: to be used when possible to facilitate reading.

References: should be arranged alphabetically by author and typed double-spaced on a separate sheet, headed, References. In the text references should be cited by author's name and date of publication (Reed, *et al.*, 1935). References should be compiled as follows:

> Fuller, J. L., & Scott, J. P. 1954. Heredity and learning ability in infra-human mammals. *Eugen. Quart.* 1: 28-43.

Abbrevations for titles of medical periodicals should conform to style adopted by the Armed Forces Medical Library, as published in the *Index-Catalogue of the Library of the Surgeon General's Office*, Fourth Series, Vol. 10.

Proofs: Galleys will be sent to author for his correction with reprint orders. One hundred reprints supplied free to each author.

MARRIAGE AND FAMILY LIVING

February, 1957, Vo. XIX, No. 1

(Special Issue on Problems and Progress in Family Life Research)

Editorial Board: James H. S. Bossard, Meyer F. Nimkoff, John Spiegel, M.D., Harold T. Christensen, Editor

Effects of Early Training on Personality
William E. Martin

Knowns and Unknowns in Marriage Counseling
Emily H. Mudd

An Orientation to Psychiatric Research on the Family
Nathan W. Ackerman

And other articles of research and interpretation of family phenomena. Abstracts and book reviews.

Published by the National Council on Family Relations
1219 University Ave., S.E., Minneapolis 14, Minnesota

Membership in the Council: $6.00 a year including subscription to Marriage and Family Living

ANNALS OF HUMAN GENETICS

Formerly Annals of Eugenics
Edited by L. S. PENROSE
Contents of Vol. 21, Pt. 3, March 1957

Genetical investigations in a North Swedish population: the offspring of first cousin marriages. J. A. Böök. With a note on the prevalence of genes for deleterious recessive traits in man. L. S. Penrose.

A contribution to the study of birth weight based on an Italian sample: twin data. M. Fraccaro.

Myopathie et Daltonisme. Analyse d'un pedigree. J. Frézal, J. de Grouchy, Mme. C. Pognan et M. Lamy.

Taste-thresholds for phenylthiocarbamide of some population groups. 2. Thresholds of two uncivilized ethnic groups living in Malaya. W. H. Lugg.

Counting methods in genetical statistics. C. A. B. Smith.

Inbreeding with selection and linkage. Selfing. E. C. R. Reeve.

The relationship between birth weight and weight gain throughout the first year. Jean Millis and Tye Cho-Yook.

Subscription $11 per volume of 4 parts
Issued by the
CAMBRIDGE UNIVERSITY PRESS
32 East 57th Street, New York 22, N. Y.

THE JOURNAL OF HEREDITY

Bi-Monthly Publication of the American Genetic Association

The *Journal of Heredity* features illustrated articles on the latest discoveries in genetics, and discussion of recent developments in the field of heredity as applied to plants and animals, including human genetics and eugenics. The situation in Soviet biological science and the effects of radiation on human populations have been the subject of several recent articles.

Subject to approval by the Council, membership in the American Genetic Association is open to persons who are professedly interested in any aspect of the science of heredity. Dues, which include subscription to the Journal, are $5.00 per annum for residents in the U. S. and $6.00 in all other countries. Subscription to the *Journal of Heredity* is $7.00 per year; foreign postage, $1.00 additional. Inquiries concerning membership and subscription orders should be addressed to the Secretary at the address below.

AMERICAN GENETIC ASSOCIATION

1507 M STREET, N.W. **WASHINGTON 5, D.C.**

JOURNAL DE GÉNÉTIQUE HUMAINE

The "Journal de Génétique humaine" is the first journal in French devoted to human genetics. It is addressed to all physicians, biologists, anthropologists and others, who might be interested in problems relating to the study of heredity in man.

The committee of editors is composed of three leading physicians and geneticists, Professor A. Franceschetti, director of the Ophthalmological Clinic, Geneva; Professor L. van Bogaert, director of the Neuro-Pathological Department of the Institute Bunge, Antwerp; and Maurice Lamy, professor of human genetics at the Medical Faculty, Paris. In addition, the committee of editors is assured the collaboration of a large number of scientists from many countries. The publication of the journal is assumed by the Institute of Medical Genetics at the University Ophthalmological Clinic, Geneva.

The journal will appear four times a year.

Price of the volume $7.00; of a separate number $2.00 payable by check or money order to

EDITIONS MÉDECINE & HYGIÈNE

GENEVA, SWITZERLAND 15, bd des Philosophes

Of interest to social and biological scientists:

CONTEMPORARY PSYCHOLOGY

A Journal of Reviews

containing

- Critical reviews of current books—reviews of scholarly value and literary merit
- Reviews of films, with sources and prices listed
- A letters-to-the-editor department
- The editor's comment on psychology's current news in books

Single copy $1.00
Subscription $8.00
Foreign $8.50

Established January 1956
Edwin G. Boring, *Harvard University*, Editor

Order from

American Psychological Association

1333 Sixteenth Street N. W. Washington 6, D. C.

THE EUGENICS REVIEW

Volume 48 | January 1957 | Number 4

CONTENTS

Notes on the Quarter:

The Expansion of Agricultural Resources : New American Inquiries into Fertility : Catholic Prize Essay : Cardinal Griffin's Last Pastoral Letter : Roman Catholicism and Contraception : Natural Selection in Relation to Population Growth : Genetics of Hæmoglobin and Blood Potassium Differences in Sheep : Two New Chromosome Markers in Man : Schizophrenia in Uniovular Twins : Our Contributors.

HOME BACKGROUND AND SELECTION FOR SECONDARY EDUCATION — F. M. Martin

ARTIFICIAL INSEMINATION (DONOR) : A SYMPOSIUM — M. H. Jackson, P. Bloom, A. S. Parkes, C. P. Blacker, C. Binney

A NEW MOVEMENT IN FRANCE — C. P. Blacker

THE EUGENICS SOCIETY
69 Eccleston Square, London, S.W. 1.
CASSELL & COMPANY, LTD.
37/38 St. Andrew's Hill
Queen Victoria Street, London, E.C. 4.

Price: Three Shillings per issue and Twelve Shillings per annum, Post Free.
Issued free to Fellows and Members of the Eugenics Society.

THE AMERICAN JOURNAL OF

HUMAN GENETICS

A quarterly record of research, review and bibliographic material relating to heredity in man, published by THE AMERICAN SOCIETY OF HUMAN GENETICS.

Editor: ARTHUR G. STEINBERG

Western Reserve University, Cleveland 6, Ohio

The editor and his staff of associates will be glad to consider manuscripts pertaining to human genetics.

Subscription to THE AMERICAN JOURNAL OF HUMAN GENETICS or information pertaining to subscription should be addressed to the Treasurer of the Society, Dr. Walter E. Heston, National Cancer Institute, Bethesda 14, Maryland. The subscription price per volume is $8.00. A volume consists of 4 numbers. Single numbers cost $2.50. The first volume was published in 1949. One volume has been published each year since then.

Correspondence pertaining to membership in THE AMERICAN SOCIETY OF HUMAN GENETICS or to general society affairs should be addressed to the Secretary of the Society, Dr. Eldon J. Gardner, Department of Zoology, Utah State Agricultural College, Logan, Utah.

ACTA GENETICAE MEDICAE ET GEMELLOLOGIAE

(A. Ge. Me. Ge.)

Published every four months from 1952 through 1956, this Journal now appears every 3 months. The Editorial Board, as well as the list of contributors, includes most of the best-known names in the field of twin-research, genetics, anthropology and related topics.

The Journal is published in Rome by the Gregor Mendel Institute of Medical Genetics and Twin-research, the founder and Director of which, Prof. Luigi Gedda, is also the Editor of this Journal.

The Editor will be glad to consider for publication manuscripts pertaining to twin-research, genetics, heredity, anthropology and related subjects.

Requests for subscriptions as well as for the publication of manuscripts should be addressed to:

ACTA GENETICAE MEDICAE ET GEMELLOLOGIAE

Largo Amba Aradam 1 ***Rome, Italy***

The yearly subscription price is $18.00 per volume. A volume consists of four issues. Back numbers may be obtained by writing to the above-mentioned address.

POPULATION STUDIES

A JOURNAL OF DEMOGRAPHY

Edited by
D. V. GLASS and E. GREBENIK

Volume 10, No. 3 March, 1957

CONTENTS

W. D. Borrie, R. Firth and J. Spillius:	The Population of Tikopia 1929-1952.
S. W. Caffin:	Increases in Recent Mortality Rates at High Ages.
D. Eversley:	A Survey of Population in an Area of Worcestershire from 1660-1850 on the Basis of Parish Records.
J. Hajnal:	The Scope of Local Authority Health Services for Old People.
Dudley Seers:	A Fertility Survey in the Maltese Islands.
A. Peacock:	Review Article.
Book Reviews:	
List of Books and Publications Received.	

Subscription price per volume of 3 parts 35/- net, post free (or American currency $5.75).
Single parts 15/- each, plus postage (American $2.50, post free).
Published by the Population Investigation Committee, at the London School of Economics and Political Science, 15 Houghton Street, W.C.2.

AMERICAN EUGENICS SOCIETY, INC.

230 PARK AVENUE, NEW YORK 17, N. Y.

OFFICERS and BOARD OF DIRECTORS

PRESIDENT

HARRY L. SHAPIRO. Curator of Anthropology, American Museum of Natural History.

VICE PRESIDENT

ALAN F. GUTTMACHER, M.D., The Mount Sinai Hospital, New York City

TREASURER

CHAUNCEY BELKNAP, Lawyer, New York City.

SECRETARY

FREDERICK OSBORN

GORDON ALLEN, M.D., National Institute of Mental Health.

MRS. DOROTHY BRUSH, Chairman, Brush Foundation for Race Betterment.

WILLIAM A. M. BURDEN, Business Administration, New York City.

ERNEST W. BURGESS, Professor Emeritus of Sociology, University of Chicago.

ROBERT C. COOK, American Genetic Association, Washington, D. C.

WATSON DAVIS, Director, Science Service, Washington, D. C.

LEE R. DICE, Institute of Human Biology, University of Michigan.

FRANK H. HANKINS, Professor Emeritus of Sociology, Smith College.

C. NASH HERNDON, M.D., Geneticist, Bowman Gray School of Medicine.

HELEN JUDY-BOND, Professor of Home Economics, Columbia University.

FRANZ J. KALLMANN, M.D., Geneticist, N. Y. State Psychiatric Institute.

DUDLEY KIRK, Demographic Director, The Population Council, Inc.

MRS. SHEPARD KRECH, Treasurer, Maternity Center Association, New York City.

CHARLES A. LINDBERGH

FRANK LORIMER, Professor of Population Studies, American University.

ARTHUR E. MORGAN, President, Community Service, Inc., Yellow Springs, Ohio.

EMILY MUDD, Director, Marriage Council of Philadelphia.

GARDNER MURPHY, Director of Research, The Menninger Foundation.

SHELDON REED, Director, the Dight Institute.

WARREN S. THOMPSON, Scripps Foundation for Population Research, Miami University.

BRUCE WALLACE, Research Associate, Long Island Biological Association, Cold Spring Harbor.